FITTERS COMPANION

THE J. L. MOTT IRON WORKS
NEW YORK

1909

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J. L. ...

Sunray Heaters

Roman and Grecian Radiators

for

Modern Heating Apparatus

The J. L. Mott Iron Works

Fifth Ave. and 17th Street

New York

Branches:

Boston *Chicago*

San Francisco *Seattle*

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INTRODUCTION

A simple and easily understood construction of both Boilers and Radiators has been the object of our efforts. The sizes range from the small Water Heater to the largest Steam Boiler needed for heating purposes, and by arranging a battery of two or more units, any capacity can be supplied.

Our construction is arranged with the idea of utilizing to the fullest extent the forces of nature for the production and diffusion of heat.

Efficiency and economy have been our watch words in all our efforts to manufacture a complete and perfect line of goods.

A close examination of our lists will prove that our Heater Ratings are conservative.

ORDERS

In ordering goods by letter, be sure that your wants are clearly stated, and each item carefully checked before order is sent in. When ordering from a traveling salesman, the order should be written on a regular order form, and after all items are checked and found correct, it should be signed by the purchaser. The person signing such order should always retain a copy of it. Mistakes in ordering are costly to rectify after shipment is made.

We have a telegraph code for ordering goods by wire, which will be found in each Boiler list, and one for Radiators and Sentences, at the end of this book. All such orders will receive prompt attention.

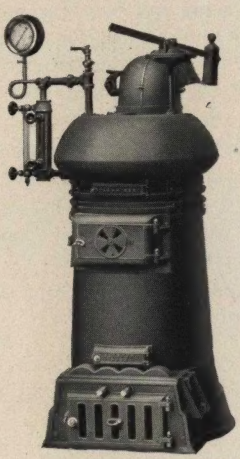
We thank our patrons heartily for the confidence they have shown in us during the past, and we in return will endeavor to make every transaction so pleasant and agreeable that we may retain your trade.

☞List prices in this Catalogue supersede all previous issues.

Sincerely yours,

THE J. L. MOTT IRON WORKS.

SUNRAY STEAM BOILERS



DIMENSIONS, CAPACITIES AND PRICES

SERIES 300 AND 400

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Size of Base	Tappings, Flow and Return	Water Line	Net Height of Boiler	Steam Radiation	Steam Price
340	15″	Boyer	7″	24×24	2½″	37″	44″	**200**	**$114**
341	15″	Boded	7″	24×24	2½″	40″	47″	**250**	**132**
351	17″	Bodice	8″	28×28	2½″	44″	49″	**300**	**150**
352	17″	Bogey	8″	28×28	2½″	48″	53″	**350**	**167**
361	20″	Bonne	8″	29×28	3″	46″	51″	**400**	**193**
362	20″	Bore	8″	29×28	3″	50″	55″	**450**	**207**
451	22″	Bold	9″	32×33	3″	47″	53″	**500**	**218**
452	22″	Bolder	9″	32×33	3″	52″	58″	**550**	**232**
453	22″	Boal	9″	32×33	3″	56″	62″	**600**	**246**

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY WATER HEATERS

DIMENSIONS, CAPACITIES AND PRICES

SERIES 300 AND 400

Number	Size o Grate	Telegraph Code Word	Smoke Pipe	Size of Base	Tappings Flow and Return	Height of Boiler	Water Radiation	Water Price
340	15″	Bodid	7″	24×24	2½″	39″	**350**	**$101**
341	15″	Bolasy	7″	24×24	2½″	42″	**400**	**118**
351	17″	Boxes	8″	28×28	3″	44″	**500**	**140**
352	17″	Barker	8″	28×28	3″	48″	**600**	**162**
361	20″	Board	8″	29×28	3″	46″	**675**	**186**
362	20″	Boak	8″	29×28	3″	50″	**775**	**197**
451	22″	Boark	9″	32×33	3½″	48″	**825**	**208**
452	22″	Boane	9″	32×33	3½″	53″	**900**	**222**
453	22″	Booard	9″	32×33	3½″	57″	**1000**	**236**

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY STEAM BOILERS

In presenting our Round "Sunray" 300 Series Boiler for both steam and water, we desire to call attention to several features in its construction that are distinct improvements over other boilers of this type.

The Base or Ash Pit

This is made in one piece which gives strength and durability to its construction. It has a draft check placed in the side allowing an automatic controller to operate without the connecting chains being interfered with when firing or using the ash pit door or shaker. The grates in this base are of the triangular pattern and can be used to shake in the regular way, or may be turned over to clean the fire.

The Deep Fire Pot Idea

The fire pot or cylinder of this heater is made deeper than in ordinary heaters, and this idea is the result of carefull experiments in combustion, with the object of getting the most value out of the fuel with the least amount of labor.

In the burning of fuel two-thirds of the value goes to gases, and the proper combustion and utilization of these gases determine the value of a heater.

Coal gas will not burn unless it is kept at a temperature of 800° or over. A bright surface fire is necessary to consume these gases, or a deep bed of fire must be kept, so the gases will be consumed as they pass up through the burning fuel.

A bright surface fire can only be had by maintaining a shallow fire and feeding it often, hence great waste results because a house-heating boiler cannot be attended to oftener than twice or three times a day.

A deep fire pot admits of burning the gases by slow combustion, and the heater will carry fire in the coldest winter weather for twelve hours, and in ordinary weather for twenty-four hours.

The Clinker Door

This heater is provided with a clinker door which facilitates the removal of obstructions that may at any time clog the grates. This door is set about two inches above the grates, which prevents the coal from falling out while the poker is being used.

The Central Screw Nipple

The cylinder and upper sections are connected by a large central nipple, which provides a free circulation to and from all parts of the heater.

The Sections Above the Fire Pot

The central sections are of a flat cart-wheel shape with openings for the passage of the smoke and gases, and are placed in such a way that the gases are diverted by contact with the heating surface at the top of each opening, thus preventing any loss of heat through the chimney except only that which is necessary to make a proper draft.

The Dome or Top Section

For the water heater we make a flat top section which, on the under side, is deeply corrugated to present a large amount of surface to the heat coming up through the middle sections.

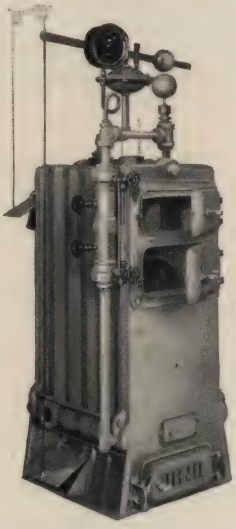
For the steam boiler we provide a round top section with a depth of about one foot, which gives large steam space.

The tapping for the steam main is taken out of this dome about six inches from the center of the top, and there is no possibility for the heater to syphon as the water and steam rises up, through the central nipples.

The Smoke Box

The smoke box is made with a draft check and a damper with a gauge to set the damper at any angle. The damper is set below the check damper so the check will work at all times, no matter how the damper may be turned.

SUNRAY STEAM BOILERS



DIMENSIONS, CAPACITIES AND PRICES

SERIES C

Number	Size of Fire Pot	Telegraph Code Word	Smoke Pipe	Floor Space including Smoke Box	Tappings, Flow and Return	Direct Radiation	Price with Trimmings	Shipping Weight
4C	13×11	Bub	7″	23×24	2—2″	**150**	**$110**	550
5C	13×14½	Bubble	7″	23×28	2—2″	**225**	**123**	700
6C	13×18	Bubo	7″	23×32	2—2″	**300**	**150**	850
7C	13×21½	Buck	8″	23×36	3—2″	**375**	**182**	1000

Water Column is not sent with Heater.

Water Gauge is put on section direct.

Height of Heater, 49″. Height of Water Line, 41″.

Depth of Fire Pot, 19″.

Use a size larger Boiler for soft coal. Fire Box is too small to insert a coil for heating water in a tank.

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY WATER HEATERS

DIMENSIONS, CAPACITIES AND PRICES

SERIES C

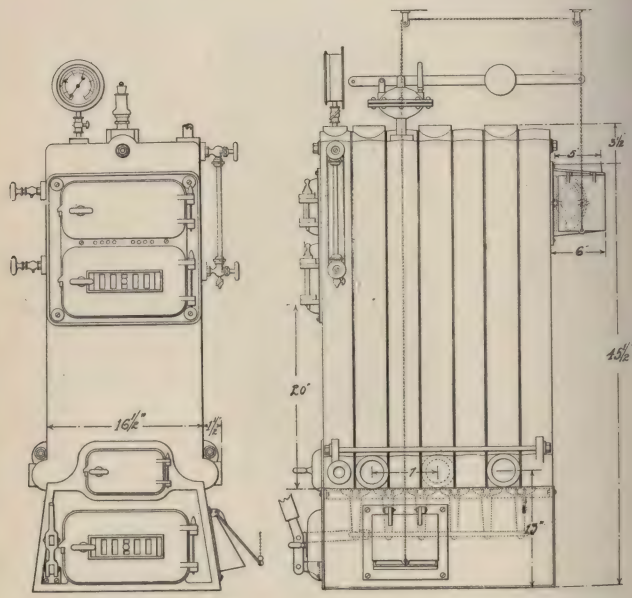
Number	Size of Fire Pot	Telegraph Code Word	Smoke Pipe	Floor Space including Smoke Box	Tappings, Flow and Return	Direct Radiation	Price	Shipping Weight
4C	13 × 11	Build	7″	23×24	2 - 2″	**300**	**$100**	550
5C	13×14½	Bulace	7″	23×28	2—2″	**400**	**113**	700
6C	13×18	Bump	7″	23×32	2—2″	**525**	**140**	850
7C	13×21½	Bunch	8″	23×36	3—2″	**625**	**172**	1000

Height of Heater, 49″. Depth of Fire Pot, 19″.

Use a size larger Boiler for soft coal. Fire Box is too small to insert a coil for heating water in a tank.

See notes on ratings and guarantee, pages 42-43.

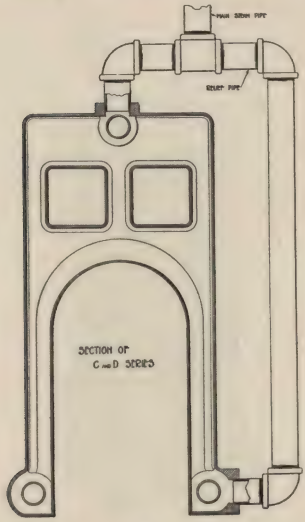
Made at and shipped from the plant near Pittsburg, Pa.



To enable the engineer to get all the dimensions of this Boiler, we show the above drawing with the measurements of different parts given. A relief pipe from the flow to return pipe is recommended when using this Heater for steam. See opposite page.

For steam heating, this Heater is superior to any other small heater. It has a perfect internal circulation, so the steam can be quickly separated from the water, thus preventing the possibility of the water boiling up into the pipe.

Actual tests of this Heater show that it will distribute 80 per cent. of the value of the fuel consumed, being a higher percentage than is given by any tubular or water tube high-power boiler.



This cut shows the middle tapped section, and how the relief pipe on the steam boilers should be connected, to get best results.

The deep fire pot, complete return flues and ample fire surface, enable this Heater to do the work economically and with little attention. It will absolutely carry coal enough to maintain perfect combustion and do its full work for twelve hours with ordinary care and attention.

This Heater is furnished with rocking and shaking grates, and has a large clinker door to clean fire.

It is made up complete and tested before shipment, and can be set in position by the fitter within a half hour.

Always remember that in ordering a small boiler, it should be larger in proportion to the radiation than when using a large boiler. It should also be observed that the radiation should be figured larger, in proportion to cubical contents, in a small house than in a large one. This is due to the fact that the wall and glass exposure is greater in proportion than on large houses.

SUNRAY STEAM BOILERS

DIMENSIONS, CAPACITIES AND PRICES

SERIES J

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Floor Space	Tappings, Flow and Return	Direct Radiation	Price with Trimmings	Shipping Weight
5J	16×16	Bias	8″	26×28	2—2½″	**400**	**$193**	1050
6J	16×20	Bibb	8″	26×33	2—2½″	**500**	**220**	1250
7J	16×24	Bidder	9″	26×38	3—2½″	**600**	**258**	1450
8J	16×28	Bigot	9″	26×43	3—2½″	**700**	**300**	1650

SERIES K

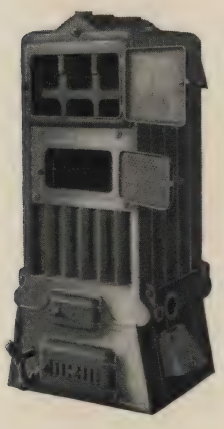
5K	17×16½	Bijou	8″	26×30	2—2½″	**450**	**207**	1100
6K	17×21	Bime	8″	26×35	2—2½″	**550**	**234**	1300
7K	17×25½	Bitum	9″	26×40	3—2½″	**650**	**288**	1500

Water Column is not sent with Heater. Water Gauge is put on section direct.
Height of Heater, 58″. Height of Water Line, 48″.
Depth of Fire Pot, 16″.
Use a size larger Boiler for soft coal.
Boiler has opening at the back for the introduction of a ¾ inch coil for heating water in a tank.

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY WATER HEATERS



DIMENSIONS, CAPACITIES AND PRICES

SERIES J

Number	Size of Grate	Telegraph Code Word	Size of Smoke Pipe	Floor Space	Tappings, Flow and Return	Direct Radiation	Price
5J	16×16	Biza	8″	26×28	2—2½″	650	$183
6J	16×20	Bishop	8″	26×33	2—2½″	825	210
7J	16×24	Bitch	9″	26×38	3—2½″	1000	248
8J	16×28	Bitter	9″	26×43	3—2½″	1200	290

SERIES K

5K	17×16½	Bitts	8″	26×30	2—2½″	750	197
6K	17×21	Bison	8″	26×35	2—2½″	925	224
7K	17×25½	Bicut	9″	26×40	3—2½″	1100	278

For shipping weights see Steam List.

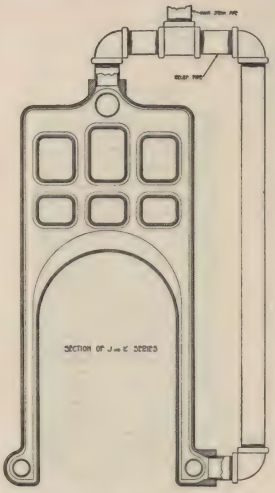
Height of Heater, 58″. Depth of Fire Pot, 16″.

Use a size larger Heater for soft coal.

Boiler has openings at the back for the introduction of a ¾-inch coil for heating water in a tank.

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.



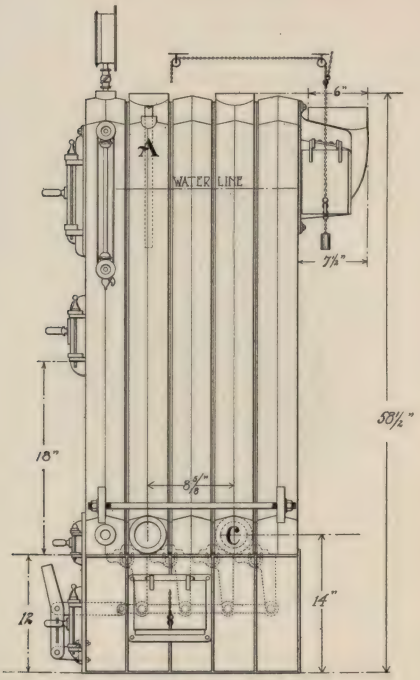
The above illustration represents one of the middle tapped sections of the J and K series, and shows how the relief pipe should be connected from the steam main to return pipe or return openings, to get the best results when used for steam heating.

TIME IS MONEY

This Heater is made up complete and tested the same as a radiator, hence no time is lost in setting up or testing. Its compact form enables it to be taken into a building as easily as a radiator, and it can be set up ready for the fitter to connect the circulating pipes within one hour.

All tappings are 2½-inch on the J and K series, so that ordinary tools only are needed to set up such a heater. If it is desired, a 3-inch main may be taken off by using a 2½-inch nipple up and a 2½ x 3-inch elbow at top. The 2½-inch opening at boiler is ample for a 3-inch main as the friction on the main is equal to one size.

The grates in this Boiler are of a rocking round top pattern similar to 900 Series shown on page 33. This Boiler also has the same damper gauge as shown on Series 50-E, page 21.



SERIES J.

A represents inside tube to extend diaphragm inlet below water line, which is much better than a syphon or water bottle.

C represents tapping on other side.

The above drawing will enable the engineer to get the principal measurements of this heater with any number of sections at a glance. The cut represents a five section heater, and the addition of one or more sections will, in proportion, add to the depth. The return openings are in the same sections as the feed opening, one on one side of the heater, and the next one on the opposite side.

SUNRAY STEAM BOILERS

DIMENSIONS, CAPACITIES AND PRICES

SERIES 50-E

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Floor Space	Tappings, Flow and Return	Direct Radiation	Price with Trimmings	Shipping Weight
54E	20×20	Badger	8″	30×38	1–3″	**450**	**$215**	1400
55E	20×26	Baffle	9″	30×44	2–3″	**600**	**260**	1700
56E	20×32	Balsam	9″	30×50	2–3″	**750**	**317**	2000
57E	20×38	Banish	10″	30×56	2–3″	**900**	**360**	2300

Height of Boiler, 52″. Height of Water Line, 42″.

Use a size larger Boiler for soft coal.

Boiler has opening at the back for the introduction of a 1″ coil for heating water in tank.

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY WATER HEATERS

DIMENSIONS, CAPACITIES AND PRICES

SERIES 50-E

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Floor Space	Tappings, Flow and Return	Direct Radiation	Price
54E	20×20	Banjo	8″	30×38	1 3″	**750**	**$205**
55E	20×26	Barren	9″	30×44	2—3″	**1000**	**250**
56E	20×32	Basin	9″	30×50	2 - 3″	**1250**	**317**
57E	20×38	Bass	10″	30×56	2—3″	**1500**	**350**

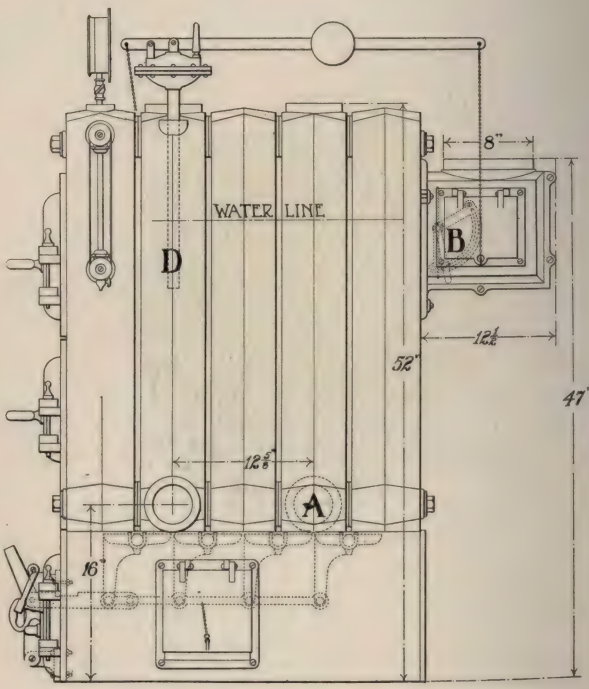
Height of Boiler, 52″. For weight see Steam List

Use a size larger Boiler for soft coal.

Boiler has openings at the back for the introduction of a 1-inch coil for heating water in a tank.

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.



Dimensions of Series 50-E Boiler
containing five sections.

A represents opening at opposite side of Boiler.

B represents segmental gauge damper on opposite side of smoke box.

D represents the piece of ½-inch pipe that screws into brass bushing to extend the diaphragm tube below the water line, so that only water comes into contact with the rubber diaphragm.

For dimensions of Boiler, with more or less sections, add to or deduct from measurements given.

Series 50-E

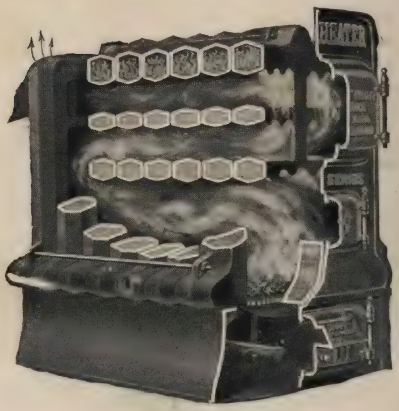
The above illustration shows the smoke connection on these Heaters. It has a segmental gauge damper which may be adjusted to suit the draft of the chimney. The check draft is also placed in this smoke box, making it very convenient for connecting with the regulator.

This gauge on the damper enables the engineer to adjust it to suit the draft of the chimney, after which the drafts can be adjusted by the ash pit damper on the side of base and the check in smoke box.

This Series is particularly adapted for steam heating, and suitable for houses with low cellars. It has shaking and dumping grates, with the shaking lever brought through the front of the heater.

The steaming qualities of this Heater are insured by its large water ways which permit a free circulation for the steam to rise to the surface.

SUNRAY STEAM BOILERS



DIMENSIONS, CAPACITIES AND PRICES

SERIES 90A

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Floor Space	Tappings, Flow and Return	Direc Radiation	Price with Trimmings	Shipping Weight
95A	24×30	Begin	9″	37×32	2—3″	**800**	**$340**	2100
96A	24×36	Begone	9″	37×38	2—3″	**1000**	**400**	2400
97A	24× 42	Behave	10″	37×44	3—3″	**1200**	**460**	2750
98A	24×48	Beheld	10″	37×50	3—3″	**1400**	**520**	3100

We supply pea coal grates for these Heaters if such are desired, but regular grates will be sent unless pea coal grates are specially called for.

Height of Heater, 58″. Height of Water Line, 46″.

Use size larger boiler for soft coal.

Boiler has openings in back for the introduction of 1″ coil for heating water in a tank.

The last figure in the number gives the number of sections in the Heater.

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY WATER HEATERS

DIMENSIONS, CAPACITIES AND PRICES

SERIES 90-A

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Floor Space	Tappings, Flow and Return	Direct Radiation	Price
95A	24×30	Bazar	9″	37×32	2 - 3″	**1325**	**$330**
96A	24×36	Beetle	9″	37×38	2 3″	**1650**	**390**
97A	24×42	Before	10″	37×44	3—3″	**1975**	**450**
98A	24×48	Beg	10″	37×50	3—3″	**2300**	**510**

We supply pea coal grates for these Heaters if such are desired, but regular grates will be sent unless pea coal grates are specially called for.

For shipping weight see Steam List.

Height of Heater, 58″.

Boiler has holes in back section for the introduction of 1″ coil to heat water in a tank.

Use a size larger Boiler for soft coal.

The last figure in the number gives the number of sections in the Heater.

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY STEAM BOILERS

DESCRIPTION

As the sections of 90-A Series are put together with push nipples, and the bolts that hold the sections together are all outside, they cannot be affected by expansion and contraction. The grates used in this series of boilers are of a very simple and durable pattern, being made to rest on the independent base so that the sections are not in any way affected by the shaking of the grates. Any bar can be taken out and replaced by another without disturbing the remaining bars, or in any way changing the heater. Though the dimensions of grates are given in the list, it is not absolutely necessary to use them the full length of the boilers, as listed. In many cases a direct advantage is gained by shortening up the fire box with fire brick.

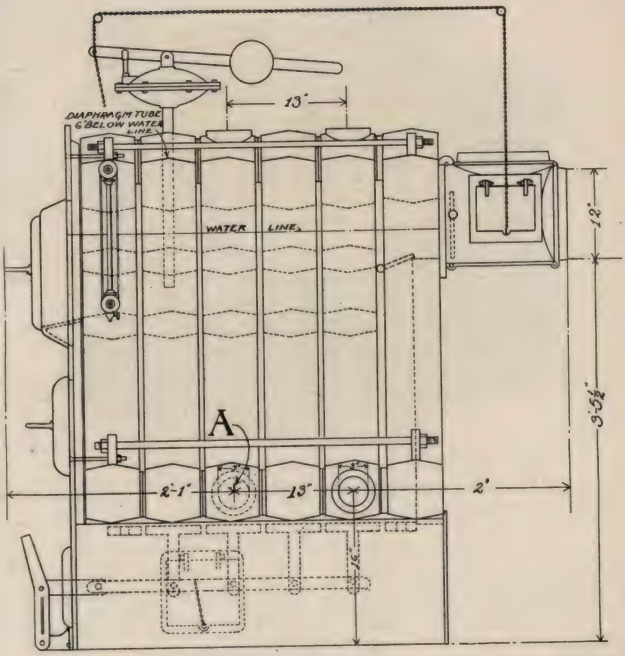
The water passages in the sections of this series are very large and afford quick circulation for the liberation of steam, which is necessary to maintain a steady water line in a steam boiler. The fire box and the upper part of the flues are corrugated, thus giving an additional amount of self-cleaning surface over the hottest part of the fire and heated gases.

All parts of the sections in these boilers are heating surfaces of the most effective kind, and we guarantee their heating capacity equal to any sectional boilers on the market, of the same size fire box and section. The ash-pits in these boilers are large and deep enough to prevent the grates burning out, as so often happens in house heating boilers. This type is in every sense a return flue safety sectional boiler, and one that any engineer can use with the assurance that it will do all the work needed for any possible want.

FINAL TEST

All heaters must pass a rigid examination before they leave our factory. Every section is tested to 70 lbs. pressure, and all parts must be found perfect before receiving the inspector's O. K. After this endorsement of approval, they are sent to our various warehouses awaiting shipment. By this method we are certain that every heater is in good condition before shipment. Heaters are not supposed to work under a greater pressure than 40 to 50 lbs. when used for tank heating purposes.

See sizes and prices on preceding pages.



SERIES 90-A.

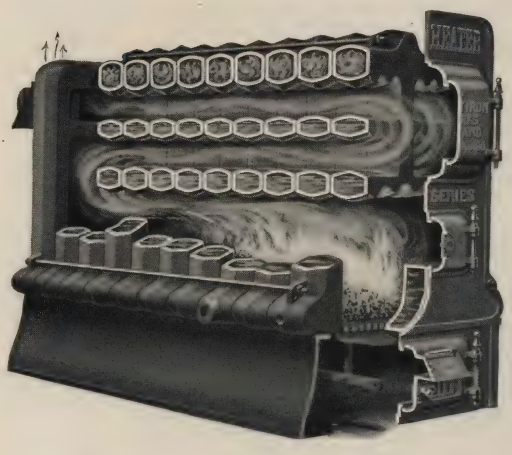
The above drawing shows a six-section heater. From this the engineer can get the exact dimensions of any size heater in this series.

A represents the tapping on opposite side of heater.

Note check damper on side of base, which keeps the damper chain away from front of the heater.

Note the diaphragm tube extending below the water line to prevent the steam coming in contact with the rubber diaphragm.

SUNRAY STEAM BOILERS



DIMENSIONS, CAPACITIES AND PRICES

SERIES 800

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Floor Space	Tappings, Flow and Return	Direct Radiation	Price with Trimmings	Shipping Weight
860	32×34	Beauty	12″	46×40	2—4″	**1500**	**$550**	4000
870	32×40	Beaver	12″	46×46	2—4″	**1800**	**660**	4400
880	32×47	Bechie	14″	46×52	2—4″	**2100**	**730**	4850
890	32×53	Becomes	14″	46×58	3—4″	**2400**	**810**	5350
891	32×59	Bed	16″	46×64	3—4″	**2700**	**875**	5850

We supply pea coal grates for these Heaters if such are desired, but regular grates will be sent unless pea coal grates are specially called for.

Height of Heater, 65″. Height of Water Line, 52″.

Boiler has holes in back section for the introduction of 1¼″ coil.

Use a size larger Boiler for soft coal.

See notes on ratings and guarantee, pages 42-43.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY WATER HEATERS

DIMENSIONS, CAPACITIES AND PRICES

SERIES 800

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Floor Space	Tappings, Flow and Return	Direct Radiation	Price
860	32×34	Beacon	12″	46×40	2—4″	**2500**	**$540**
870	32×40	Bead	12″	46×46	2—4″	**3000**	**630**
880	32×47	Beak	14″	46×52	3—4″	**3500**	**710**
890	32×53	Beam	14″	46×58	3—4″	**4000**	**790**
891	32×59	Bear	16″	46×64	3—4″	**4500**	**855**

We supply pea coal grates for these Heaters if such are desired, but regular grates only will be sent unless pea coal grates are specially called for.

For shipping weights see Steam List.

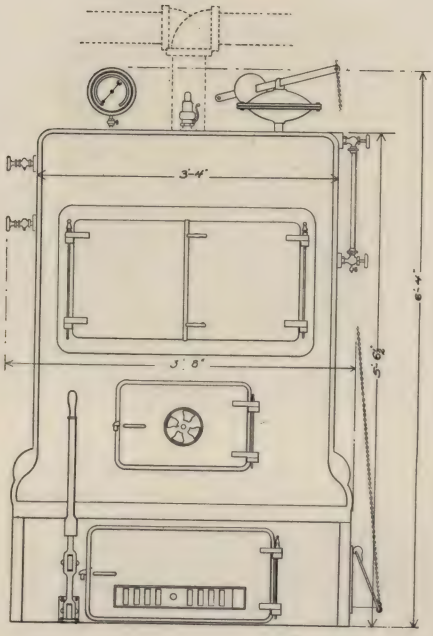
Height of Heater, 65″.

Boiler has holes in back section for the introduction of 1″ coil.

Use a size larger Boiler for soft coal.

See notes on ratings and guarantee, pages 42-43.

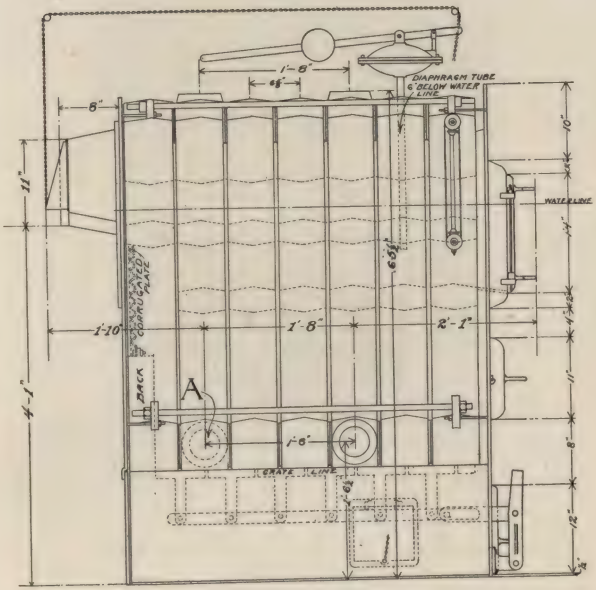
Made at and shipped from the plant near Pittsburg, Pa.



The above drawing shows a front view of the 800 series. From this the engineer can get the dimensions of the width and height of this series.

The position of steam pipes at the top may be raised or lowered to suit the conditions.

The water gauge and try cocks are placed directly on the side of the front section, which does away with the trouble experienced in connecting water column and fittings.



SERIES 800.

The above drawing shows a seven-section heater. From this the engineer can get the exact dimensions of any size heater in this series.

In a boiler larger than the 809 it is better to use a bridge wall section as illustrated on page 26. A fire box too long does not give the best results.

A represents tapping on the opposite side of the heater.

SUNRAY STEAM BOILERS

DIMENSIONS, CAPACITIES AND PRICES

SERIES 900

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Floor Space	Size of Tappings		Direct Radiation	Price with Trimmings
					Flow	*Return		
906	36×34	Bisell	14″	52×48	2—6″	2—4″	**2200**	**$ 755**
907	36×40	Biker	14″	52×55	2—6″	2—4″	**2600**	**850**
908	36×46	Biard	15″	52×62	2—6″	2—4″	**3000**	**945**
909	36×52	Birles	16″	52×67	2—6″	2—4″	**3400**	**1025**
910	36×58	Birens	17″	52×74	2—6″	2—4″	**3800**	**1105**
911	36×58	Bipard	18″	52×81	2—6″	2—4″	**4200**	**1185**
912	36×64	Biped	18″	52×88	2—6″	2—4″	**4600**	**1265**
913	36×64	Bigas	18″	52×95	2—6″	2 4″	**5000**	**1345**

SERIES 950

956	36×32	Biblic	14″	52×46	2—6″	2—4″	**2000**	**$ 700**
957	36×38	Birley	14″	52×53	2—6″	2—4″	**2400**	**810**
958	36×44	Birlap	15″	52×59	2—6″	2—4″	**2800**	**905**
959	36×50	Birket	15″	52×65	2—6″	2—4″	**3200**	**985**
960	36×56	Birdame	16″	52×72	2—6″	2 4″	**3600**	**1065**
961	36×62	Birdell	17″	52×79	2—6″	2—4″	**4000**	**1145**
962	36×62	Birgole	18″	52×86	2—6″	2—4″	**4400**	**1225**
963	36×68	Biscuit	18″	52×92	2—6″	2—4″	**4800**	**1305**

Height of Heater, 76″. Height of Water Line, 61″.

*There is a 6″ return opening at back in addition to above, and openings for coil.

Shipping weight, 906-4500 lbs. Add 600 lbs. for each section.

See notes on ratings and guarantee, pages 42-43.

SUNRAY WATER HEATERS

DIMENSIONS, CAPACITIES AND PRICES

SERIES 900

Number	Size of Grate	Telegraph Code Word	Smoke Pipe	Floor Space	Size of Tapping		Direct Radiation	Price
					Flow	*Return		
906	36×34	Bill	14″	52×48	2—6″	2—4″	**3675**	**$ 735**
907	36×40	Bier	14″	52×55	2—6″	2—4″	**4350**	**830**
908	36×46	Bird	15″	52×62	2 - 6″	2 - 4″	**5000**	**925**
909	36×52	Bink	16″	52×67	2 - 6″	2—4″	**5675**	**1005**
910	36×58	Bind	17″	52×74	2—6″	2—4″	**6350**	**1085**
911	36×58	Bilk	18″	52×81	2—6″	2 - 4″	**7025**	**1165**
912	36×64	Bick	18″	52×88	2—6″	2—4″	**7700**	**1245**
913	36×64	Biler	18″	52×94	2 - 6″	2—4″	**8375**	**1325**

SERIES 950

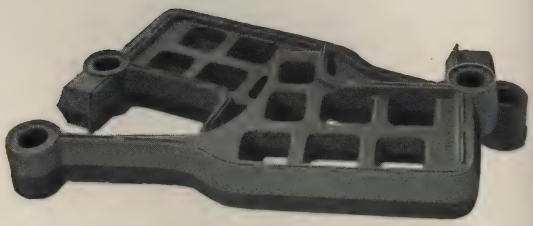
956	36×32	Birlong	14″	52×46	2—6″	2—4″	**3300**	**$ 690**
957	36×38	Birkel	14″	52×53	2—6″	2 - 4″	**3975**	**790**
958	36×44	Bipper	15″	52×59	2—6″	2 - 4″	**4650**	**885**
959	36×50	Birkness	15″	52×65	2—6″	2—4″	**5300**	**965**
960	36×56	Birham	16″	52×72	2—6″	2—4″	**5975**	**1045**
961	36×62	Binner	17″	52×79	2 - 6″	2—4″	**6650**	**1125**
962	36×62	Bimbard	18″	52×86	2—6″	2—4″	**7325**	**1205**
963	36×68	Bimbole	18″	52×92	2 - 6″	2 - 4″	**8000**	**1285**

Height of Boiler, 76″.

*There is a 6″ return opening at back in addition to above, and openings for coil.

Shipping weight, 906-4500 lbs. Add 600 lbs. for each section.

See notes on ratings and guarantee, pages 42-43.



Illustrating the two halves of a middle section of 900 and 950 Series

The 900 Series Boiler has many new features of construction, which will commend themselves to the engineer who wants a thoroughly efficient and economical heater.

For simplicity of construction this boiler has no equal. The sections are divided in the center of the boiler, a feature that makes it easier to handle and set up. The divided sections provide for all expansion and contraction, and so add to the durability of the boiler in use.

A heater has three functions to perform, namely: the proper burning of the fuel, (including all the gases that are liberated during the process of combustion), the absorption of the heat given off by combustion into the water to make steam, and finally, the separation of the steam from the water in the boiler, for distribution to the various radiators in the building.

To burn the fuel properly, slow combustion is the best and most economical method; it consumes all the gases as fast as liberated, but such results can be obtained only from a heater having a deep fire pot. In this boiler the depth of fire pot is 16 inches.

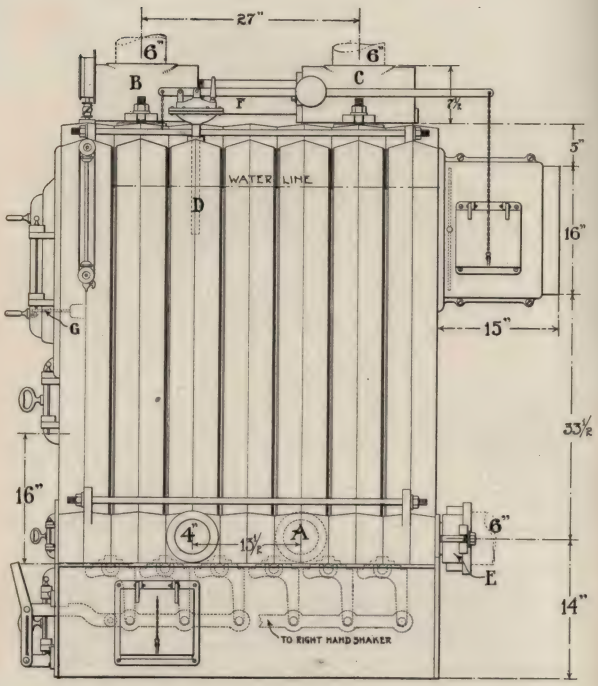
Illustrating the round top Grinding Grate of the 900 and 950 Series.

The separation of the steam from the water at the water line is an important feature of any Heater, and in the 900 Series we have features of construction that provide for perfect circulation to produce this result.

THE GRATES.—A heater provided with a deep fire pot requires a more powerful grate than one with a shallow fire pot. The grates in the 900 Series have a round top and are provided with grinders which remove all ashes or clinkers, without wasting the fuel.

We also make a flat close grate for pea coal, which can be sent in place of the regular grate if so ordered.

CLINKER DOORS.—At times it may be desired to remove the clinkers without grinding them up, and again it may be necessary to clean out the fire box to start a fresh fire. For this purpose the 900 Series is provided with large clinker doors at the grate line.



The above drawing shows a seven section Boiler of 900 Series. From this the engineer can get the exact dimensions of any size in the series.

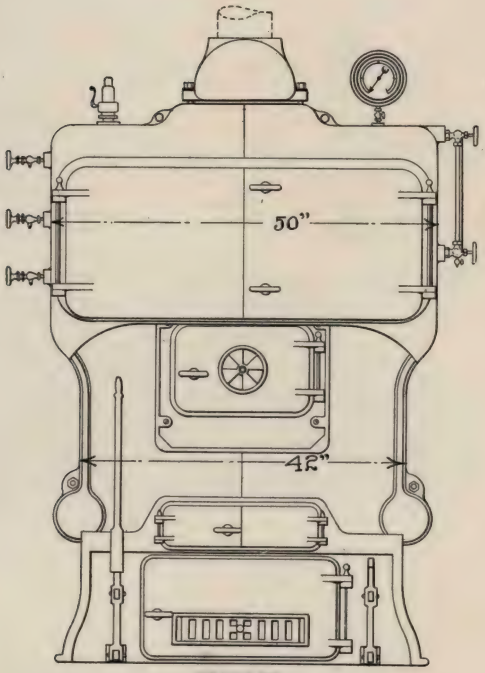
A represents the tapping at opposite side of the heater.

B and **C** represent the top, front and back headers, which are tapped for 6-inch pipe, and can be bushed to any desired size.

D represents diaphragm tube which extends 6 inches below the water line of boiler.

E represents the back header which connects the two halves of the boiler and is tapped for 6-inch pipe.

F represents the connecting pipe between the top headers for steam. This connecting pipe is not necessary for water heating.



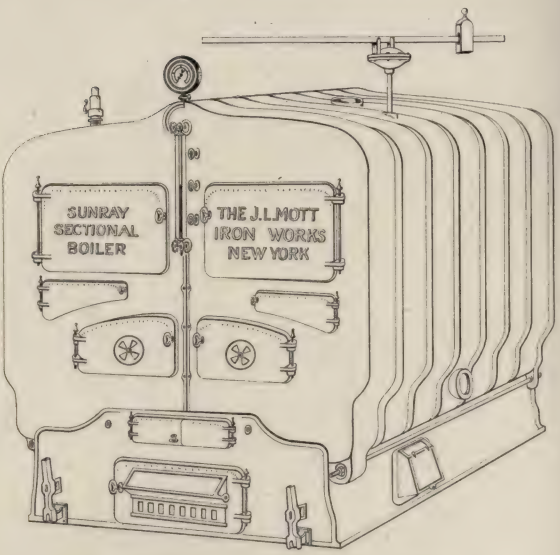
FRONT

The above drawing shows a front view of 900 Series Water Heater. From this the engineer can get the exact dimensions of the width needed for the installation of this type of Heater.

The dotted lines show the position of flow pipes. The water column may be put on either side of the Heater, as tappings are provided on each side of front section.

No. 911 and all above that number have a bridge wall section.

SUNRAY STEAM BOILERS



DIMENSIONS, CAPACITIES AND PRICES

Number	Average Size of Fire Pot	Telegraph Code Word	Number of Tapped Outlets	Smoke Pipe	Floor Space	Direct Radiation	Price with Trimmings
276	45×50	Bee	3—5″	18″	72× 60	**4100**	**$1164**
277	54×50	Beech	3—5″	18″	72× 69	**4950**	**1334**
278	63×50	Beef	3—5″	20″	72× 78	**5800**	**1504**
279	72×50	Beeves	4—5″	20″	72× 87	**6650**	**1674**
280	81×50	Beet	4—5″	21″	72× 96	**7500**	**1844**
281	90×50	Beggar	4—5″	21″	72×105	**8350**	**2014**

No. 276 weighs 7500 lbs. Add 1150 lbs. for each additional section.

The ratings on above boiler are based on a rate of combustion of 7½ lbs. of coal per square foot of grate per hour.

If it is found that there is too much grate surface for the strength of the draft, one or more sections of the grate may be taken out of the back and the space filled up with fire brick.

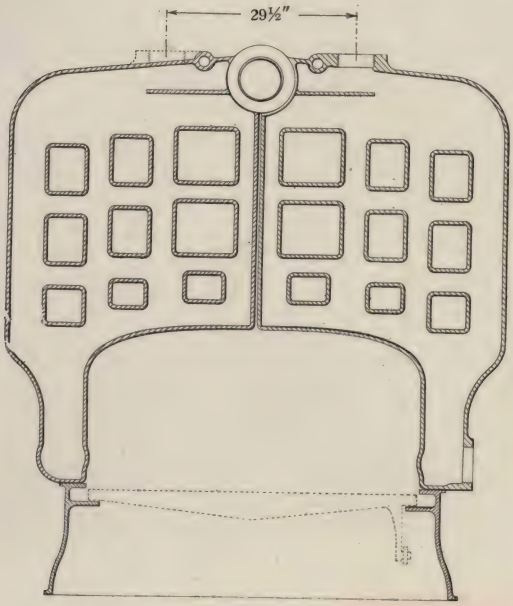
Width of boiler 72″ not counting trimmings.

Height of boiler 82″ not counting trimmings.

Water line 70″. Smoke box extends 15″ beyond the back section. Back section has openings for the introduction for a 1″ coil.

See notes on ratings and guarantee on pages 42-43.

SUNRAY WATER HEATERS



DIMENSIONS, CAPACITIES AND PRICES

Number	Average Size of Fire Pot	Telegraph Code Word	Number of Tapped Outlets	Smoke Pipe	Floor Space	Direct Radiation	Price
276	45×50	Beast	3—5″	18″	72× 60	**6400**	**$1144**
277	54×50	Beating	3—5″	18″	72× 69	**7800**	**1314**
278	63×50	Because	3—5″	20″	72× 78	**9200**	**1484**
279	72×50	Beckon	4—5″	20″	72× 87	**10600**	**1654**
280	81×50	Beclip	4—5″	21″	72× 96	**12000**	**1824**
281	90×50	Becurl	4—5″	21″	72×105	**13400**	**1994**

Width of heater 72″. Height of heater 82″.

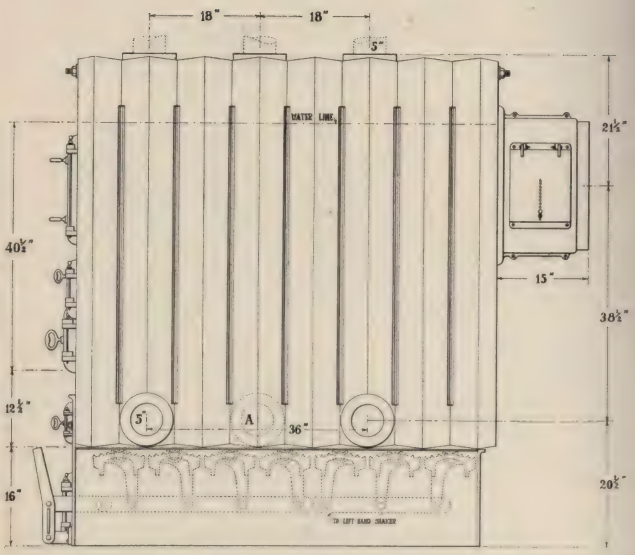
Smoke box extends 15″ beyond back section.

Smoke box is made regular with smoke collar in the back, but it can be made out of top if so ordered.

Ratings are based on a combustion of 7½ lbs. of coal per square foot of grate per hour.

The back section has openings for the introduction of a 1″ coil for heating water.

See notes on ratings and guarantee on pages 42-43.



The above drawing shows all dimensions of the boiler, and enables the engineer to properly take measurements for his piping.

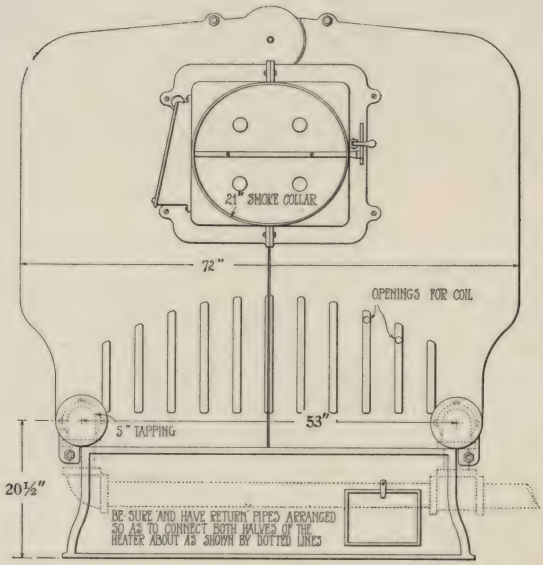
The last figure or figures in a number represent the number of double sections in the heater.

To get the horse power of these boilers divide the steam radiating surface by 120.

The heating surface measures 54 sq. feet per section.

The boiler is made up of divided sections which connect at the top by lapping one over the other to form a 6" Header through the upper part of the section.

The grates and shaking apparatus in this boiler are very strong and made for heavy duty.



Illustrating the back of boiler showing how to cross-connect the two parts of the boiler so the water will equalize in each half. The openings in the rear are 5", but the engineer may reduce them to any size desired.

As the sections of this boiler are in two parts, they can be passed through a comparatively small door or window, which makes them very convenient for handling and getting into any kind of building.

The bolts used to hold this boiler together are on the outside of the water ways. When drawing up the sections, the bolts can be passed through the slip nipples which gives more direct pressure and enables the fitter to work more rapidly.

REPAIRS FOR HEATERS

When ordering repairs of any kind it is necessary to give all the information possible in regard to the parts wanted. **We must have** the number and date of the Heater. If this cannot be found owing to Heater being covered or the number lost, the Heater should be described as nearly as possible, giving dimensions of fire-box, size of base and height of Heater. With these particulars we can generally get at what is wanted.

Old Patterns

Old style square series Water Heaters have two patterns of grate for each size, one being the flat shaking pattern which shakes from side to side and the other a triangular revolving grate with cog wheels on the front of each bar. When ordering less than a set it is always wise to send a sketch (top view) of the complete grate, marking on it which bars are needed. It is necessary to state which pattern is wanted.

Old style Header Boilers known as the 100, 200 and 300 series, have grate bars with both short and long shanks. The length of the shank should always be given when ordering for any of these series, also a sketch of the end of the grate showing whether round or flat top.

Round Series numbering from 22 to 32 have the number on the top of the heater, hence if the heater is covered with asbestos, the number may be hard to find, but by giving the diameter of fire pot across the door, and the height of the Heater from the floor, including the feet, we can always tell the number of the Heater.

Sectional Boilers numbering from 600 to 760 are not now made, but repairs can be supplied for them. Be careful to give number of Boiler or state size of fire box, height of Heater, and the number of sections in the Heater.

If you cannot describe the part wanted, make a sketch or send a paper pattern of what is required.

Boilers Nos. 63, 64 and 47 take the same base and grate as No. 27. Nos. 65 and 66, take the same base and grate as No. 30. Nos. 44 and 45 have the same base and grate as No. 25.

REPAIRS FOR MODERN BOILERS

For all Boilers in this catalogue, excepting the round series, we now publish illustrated circulars and a price list of all the parts that go to make up a boiler. These lists will be sent to the trade on application.

Doors and Door Frames

It is always better to order a door frame with a door for the reason that each door is fitted to a frame before it is drilled and it is almost certain that any door ordered will not fit the frame you have. If doors or frames are ordered separately, they will be sent without the holes for the pins, leaving same to be drilled to suit the frame on the Heater. Time will always be saved however by ordering doors and frames at the same time.

Cannot Be Supplied

Sections for the old square series, sections for Boilers Nos. 600 to 612 and sections for Nos.400 to 414 cannot now be supplied as the patterns were destroyed by fire in 1902. Patterns for Nos. 51, 61, 71, 81 and 91 were also destroyed by fire in 1907, and cannot be replaced; but all small castings needed for repairs can still be supplied.

Grate Bars

Boilers Nos. 22 to 32 in the Round Series can be supplied with pea coal grates if so ordered. Sectional Boilers Nos. 70, 90, 80, 800, 900, 950 and Series 3 can also be supplied with pea coal grates if so ordered.

Dates on Boilers

Dates on Boilers represent some change made in the pattern that year. On the 70 and 80 Series the date 1904 appears on all Boilers made since that date, and it must be so stated when ordering castings to get them right. The date 1908 appears on the **J** & **K** Series which represents a change to a larger feed door.

The letters **"A," "B" & "E"** on the 50 Series represent a change from side shaker to front shaker which means an entire change of grate. The letter **"A,"** on Series 3 also marks a change from side shaker to front shaker.

POINTS ABOUT SETTING SUNRAY HEATERS

A card is sent out with each Heater giving full directions how to set it up, but we here give a few of the salient points to be observed.

Steam Boilers

See that the draft is good and that the size of chimney is as large (round or square) as that given in our list for the size Boiler being set up; also that the chimney extends above the highest part of the roof. Without a good strong draft no Steam Boiler or Water Heater will work properly. If the draft is poor, a Heater of larger size will be necessary.

See that the grates are in good condition, and if complaint is made that the fire box is too long, it can be shortened by taking out one or more of the rear grates, filling in the space with fire brick placed in the back of the fire box.

In preparing the foundation for the Boiler, set it as low as possible; the more space there is between the water line of the Steam Boiler and the end of the main, the better the Boiler will work. In setting indirect radiation, this point needs careful attention. There should be not less than 18 inches (and 36 inches would be better) between the bottom of stack and the water line.

In putting the Boiler sections together see that the push nipples are entered true, and in drawing up the bolts, put the wood blocks over the bolts to act as washers, drawing up each section all but 1/16″ before adding the next one; saw off the wood blocks the thickness of a section, and proceed in the same manner until all are drawn up. Should a nipple be loose and leak after the sections are up, take it out, wrap a little fine, hard thread around it and draw up again. Do not put candle wick between the sections as they do not always face.

All boilers should be drawn up at the push nipples, and each section should nearly touch the adjacent one. Neglect of this will leave too much space between the grate bars, or in Boilers with a separate base, if not drawn the base will not be a good fit.

When the Boiler is set up and tested, the space between the sections should be filled in with Boiler cement, especially around the inside central flue, and all spaces where the smoke is not intended to go.

SUNRAY BOILER RATINGS

IMPORTANT NOTICE

All Steam Boilers and Water Heaters are rated for the actual radiation they will carry, including all flow pipes, return pipes and risers which mus be covered as well, and ample allowance should be made by the engineer for bad drafts, exposed location and for poorly constructed buildings.

All ratings are based on the standard of two pounds pressure at the Boiler, in Steam Boilers, and the standard temperature of 170 degrees at the Heater, in Water Heaters.

All ratings are based on the assumption that hard coal is used as fuel ; if bituminous coal is used, a Boiler one size larger is necessary.

In estimating the size of Boiler, a liberal allowance should be made for the radiation from the flow and return pipes and fittings, even when the pipes are covered ; good practice puts this at 25 to 50 per cent.

All ratings are for direct radiation. If direct-indirect is used, the Boiler should be 40 per cent. larger ; and if indirect is used, 75 per cent. larger than for direct radiation. This refers to ordinary house work, and does not apply to ventilating work, which needs extra capacity.

If the main flow and return pipes are not covered, the loss of heat per square foot is much greater than is given off by the radiators, and provision should be made accordingly. 60 per cent. added to the radiation will not be too much in such a case.

Our Boiler ratings must be applied only to Radiators that are ample in quantity to heat the building in which they are installed. This must be equal to the quantity supplied by Carpenter's Rule on page 129. The piping between the Boiler and Radiators must be properly proportioned and erected in accordance with good practice.

All Boilers must be attached to a chimney of sufficient size with a good draft. The chimney must not be less (round or square) than given in the list for the Boiler specified; it must also be of ample height and must be used only for the Boiler.

Our Boilers are guaranteed only to the extent of furnishing new castings for any found defective in manufacture.

The listed ratings are conservatively made and in accordance with accepted standards, but on account of the varying conditions surrounding the installation of Boilers, we do not guarantee our Boilers excepting as above.

When a pipe coil is introduced in the fire box of a Boiler, or a steam coil placed in a tank for the purpose of heating water for domestic use, additional capacity must be provided when determining the size of Boiler required, as follows: Two square feet of radiation for hot water, and 1¼ square feet of radiation for steam for each gallon of water heated 50 degrees per hour.

TANK CAPACITIES

The tank capacities of our Water Heaters represent the size of tanks which experience has shown that the Heaters will supply for ordinary family use. For any special requirements, proper capacities should be provided.

In all Water Heaters the tank capacity in gallons can be ascertained by adding 25 per cent to the hot water radiating capacity.

When Heaters are used under pressure for furnishing hot water, the water pressure on the heater and pipes should be reduced by a reducing pressure valve to 40 lbs. or less. It is not safe to work a heater above this pressure. It is well to remember that tank heaters often have a strong fire in them when little or no water is being used, and steam is likely to be generated in the tank and excess pressure results; hence a safety valve should be put on such heaters set at 10 pounds beyond the water pressure.

In ordering tank heaters for high buildings always state the height of building or give the water pressure.

BOILER COVERINGS

Sufficient covering is sent with each boiler to stop up all joints between the sections and to make the boiler fire and smoke tight, but not to cover the boiler. One bag will be supplied for six sections of the 50E and 90A Series Boilers, one bag for four sections of the 800 Series Boilers, and one bag for three sections of the 900 and Series 270 Boilers. If it is desired to cover the boiler 1½ inches thick, three times this quantity will be necessary. Price of covering $4.00 per sack, subject to same discount as boilers. Covering weighs one hundred pounds per sack.

WOOD BURNING

Several of our boilers are well adapted for the burning of wood; hence parties in wood burning districts are requested to state their requirements, and we will recommend the best type and size heater to do the work.

Hard coal, stove or egg size, is the standard on which our capacities are based. If other fuels are used, careful calculation is necessary to get the same result. For small heaters stove or nut is best; for the larger sizes egg size may be used.

Soft coal requires a larger grate surface for the reason that it cakes together and the draft cannot get through it so easily. It also requires more boiler surface for the reason that the soot of soft coal is harder to get off than the dust from hard coal, and soot prevents to some extent the passage of the heat to the water.

Pea coal.—Experiments on power boilers have shown that 50 per cent more power can be developed with the same boiler when using anthracite egg coal as against anthracite pea coal. This does not mean that furnace coal is more economical, but that with pea coal, to get the same results, a boiler one half larger is necessary, unless the draft is exceptionally strong. This is due to the fact that the pea and similar sizes of coal burn slower and yield their heat less readily than the larger sizes of hard coal. If the conditions are properly considered, however, there is no reason why one ton of pea coal should not give up as much heat as the larger sizes. A larger expense in boiler power is all that is necessary to allow pea coal to be used.

Be careful to examine the chimney of the building in which you propose to install the heater. If it is not as large as the catalogue calls for, as necessary for the boiler needed, do not take chances—it will not pay. It is well to remember that what is a good draft for a stove or a furnace may be a very poor draft for a heater which may have to do the work of twenty stoves or six furnaces.

Every pound of coal requires about 300 cubic feet of air to burn it. It, therefore, requires ten times as much air to properly burn one hundred pounds of coal as it does to burn ten, and so on. Don't try to do what is impossible; a boy may sometimes be made to do a man's work, but a small chimney cannot possibly do the work of a large one.

THREE COLUMN

FOR STEAM OR WATER

ROMAN THREE COLUMN RADIATORS

No. of Sections	Length 2½ in. per Section.	Heating Surface—Square Feet				
		45 in. high, 6½ sq. ft per sec.	38 in. high, 5½ sq. ft. per sec.	32 in. high, 4¾ sq. ft. per sec.	26 in. high, 4 sq. ft. per sec.	20 in. high 3¼ sq. ft. per sec.
3	7½	19½	16½	14¼	12	9¾
4	10	26	22	19	16	13
5	12½	32½	27½	23¾	20	16¼
6	15	39	33	28½	24	19½
7	17½	45½	38½	33¼	28	22¾
8	20	52	44	38	32	26
9	22½	58½	49½	42¾	36	29¼
10	25	65	55	47½	40	32½
11	27½	71½	60½	52¼	44	35¾
12	30	78	66	57	48	39
13	32½	84½	71½	61¾	52	42¼
14	35	91	77	66½	56	45½
15	37½	97½	82½	71¼	60	48¾
16	40	104	88	76	64	52
17	42½	110½	93½	80¾	68	55¼
18	45	117	99	85½	72	58½
19	47½	123½	104½	90¼	76	61¾
20	50	130	110	95	80	65
21	52½	136½	115½	99¾	84	68¼
22	55	143	121	104½	88	71½
23	57½	149½	126½	109¼	92	74¾
24	60	156	132	114	96	78
25	62½	162½	137½	118¾	100	81¼
26	65	169	143	123½	104	84½
27	67½	175½	148½	128¼	108	87¾
28	70	182	154	133	112	91
29	72½	188½	159½	137¾	116	94¼
30	75	195	165	142½	120	97½
31	77½	201½	170½	147¼	124	100¾
32	80	208	176	152	128	104
Price per sq. foot,		**42c.**	**42c.**	**46c.**	**50c.**	**57c.**

TAPPINGS :—All Radiators are tapped 2″, and bushed as follows :

Containing 26 feet or under, 1 inch.
Containing above 26 feet but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet but not exceeding 112 feet, 1½ inch.
Containing above 112 feet, 2 inch.

Add ½ inch to length for each bushing.

Width of section, 9½ inches; width across feet, 10¼ inches.

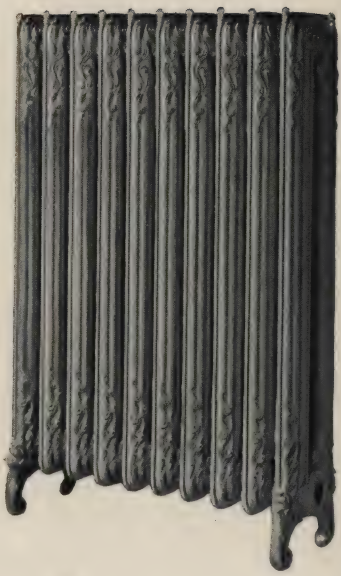
Distance from floor to center of tapping, 5 inches.

Distance from floor to center of top tapping as follows: 45″, 42½; 38″, 35½; 32″, 29½; 26″, 23½; 20″, 12½.

Radiators are made at and shipped from the plant near Pittsburg, Pa., and at Corry, Pa.

Ventilating Base can be attached to the above pattern.

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushing if so ordered.



TWO COLUMN

FOR STEAM OR WATER

ROMAN TWO COLUMN RADIATORS

No. of Sections	Length, 2½ in. per section	Heating Surface—Square Feet				
		45 in. high 5 sq. ft. per sec.	38 in. high 4 sq. ft. per sec.	32 in. high 3⅓ sq. ft. per sec.	26 in. high 2⅔ sq. ft. per sec.	20 in. high 2 sq. ft. per sec.
2	5	10	8	6⅔	5⅓	4
3	7½	15	12	10	8	6
4	10	20	16	13⅓	10⅔	8
5	12½	25	20	16⅔	13⅓	10
6	15	30	24	20	16	12
7	17½	35	28	23⅓	18⅔	14
8	20	40	32	26⅔	21⅓	16
9	22½	45	36	30	24	18
10	25	50	40	33⅓	26⅔	20
11	27½	55	44	36⅔	29⅓	22
12	30	60	48	40	32	24
13	32½	65	52	43⅓	34⅔	26
14	35	70	56	46⅔	37⅓	28
15	37½	75	60	50	40	30
16	40	80	64	53⅓	42⅔	32
17	42½	85	68	56⅔	45⅓	34
18	45	90	72	60	48	36
19	47½	95	76	63⅓	50⅔	38
20	50	100	80	66⅔	53⅓	40
21	52½	105	84	70	56	42
22	55	110	88	73⅓	58⅔	44
23	57½	115	92	76⅔	61⅓	46
24	60	120	96	80	64	48
25	62½	125	100	83⅓	66⅔	50
26	65	130	104	86⅔	69⅓	52
27	67½	135	108	90	72	54
28	70	140	112	93⅓	74⅔	56
29	72½	145	116	96⅔	77⅓	58
30	75	150	120	100	80	60
31	77½	155	124	103⅓	82⅔	62
32	80	160	128	106⅔	85⅓	64
Price per sq. foot		**42c.**	**42c.**	**46c.**	**50c.**	**57c.**

TAPPINGS:—All radiators are tapped 2″, and bushed as follows:
Containing 26 feet or under, 1 inch.
Containing above 26 feet but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet but not exceeding 112 feet, 1½ inch.
Containing above 112 feet, 2 inch.

Add ½ inch to length for each bushing.

Width of section, 7¾ inches; width across feet, 8½ inches.

Distance from floor to center of tapping, 4½ inches.

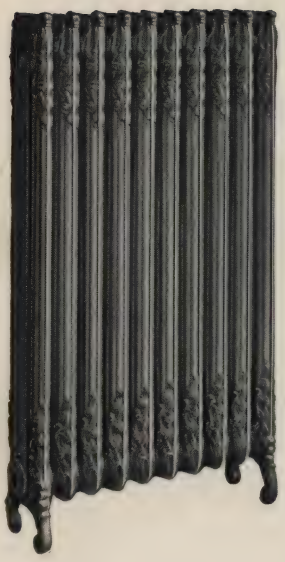
Distance from floor to center of top tapping as follows: 45″, 42½; 38″, 36⅛; 32″, 30⅛; 26″, 24⅛; 20″, 18⅛.

Radiators are made at and shipped from the plant near Pittsburg, Pa., and at Corry, Pa.

Ventilating Base can be attached to the above pattern.

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushings if so ordered.

ROMAN RADIATORS



SINGLE COLUMN

FOR STEAM OR WATER

ROMAN SINGLE COLUMN RADIATORS

No. of Sections	Length, 2½ in. per Section	Heating Surface—Square Feet			
		38 in. high, 3 sq. ft. per sec.	32 in. high, 2½ sq. ft. per sec.	26 in. high, 2 sq. ft. per sec.	18 in. high, 1½ sq. ft. per sec.
2	5	6	5	4	3
3	7½	9	7½	6	4½
4	10	12	10	8	6
5	12½	15	12½	10	7½
6	15	18	15	12	9
7	17½	21	17½	14	10½
8	20	24	20	16	12
9	22½	27	22½	18	13½
10	25	30	25	20	15
11	27½	33	27½	22	16½
12	30	36	30	24	18
13	32½	39	32½	26	19½
14	35	42	35	28	21
15	37½	45	37½	30	22½
16	40	48	40	32	24
17	42½	51	42½	34	25½
18	45	54	45	36	27
19	47½	57	47½	38	28½
20	50	60	50	40	30
21	52½	63	52½	42	31½
22	55	66	55	44	33
23	57½	69	57½	46	34½
24	60	72	60	48	36
25	62½	75	62½	50	37½
26	65	78	65	52	39
27	67½	81	67½	54	40½
28	70	84	70	56	42
29	72½	87	72½	58	43½
30	75	90	75	60	45
Price per sq. foot,		**42c.**	**46c.**	**50c.**	**58c.**

TAPPINGS:—All single column Radiators are tapped 1½", and bushed as follows:

Containing 26 feet or under, 1 inch.
Containing above 26 feet but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet but not exceeding 112 feet, 1½ inch.

Add ½ inch to length for each bushing.

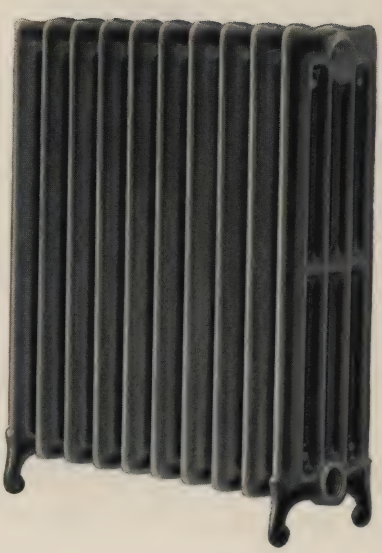
Width of section, 5¼ inches; width across feet, 5¾ inches.

Distance from floor to center of tapping, 4½ inches.

Distance from floor to center of top tappings as follows; 38", 35¾; 32", 30; 26", 24; 18", 15¾.

Radiators are made at and shipped from the plant near Pittsburg, Pa., and at Corry, Pa,

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushings if so ordered.



FOUR COLUMN

FOR STEAM OR WATER

GRECIAN FOUR COLUMN RADIATORS

No. of Sections	Length 3 in. per section	Heating Surface—Square Feet					
		45 in. high 9½ sq. ft. per sec.	38 in. high 8 sq. ft. per sec.	32 in. high 6½ sq. ft. per sec.	26 in. high 5 sq. ft. per sec.	23 in. high 4¼ sq.ft. per sec.	20 in. high 3½ sq.ft. per sec.
2	6	19	16	13	10	8¼	7
3	9	28½	24	19½	15	12¾	10½
4	12	38	32	26	20	17	14
5	15	47½	40	32½	25	21¼	17½
6	18	57	48	39	30	25½	21
7	21	66½	56	45½	35	29¾	24½
8	24	76	64	52	40	34	28
9	27	85½	72	58½	45	38¼	31½
10	30	95	80	65	50	42½	35
11	33	104½	88	71½	55	46¾	38½
12	36	114	96	78	60	51	42
13	39	123½	104	84½	65	55¼	45½
14	42	133	112	91	70	59½	49
15	45	142½	120	97½	75	63¾	52½
16	48	152	128	104	80	68	56
17	51	161½	136	110½	85	72¼	59½
18	54	171	144	117	90	76½	63
19	57	180½	152	123½	95	80¾	66½
20	60	190	160	130	100	85	70
21	63	199½	168	136½	105	89¼	73½
22	66	209	176	143	110	93½	77
23	69	218½	184	149½	115	97¾	80½
24	72	228	192	156	120	102	84
25	75	237½	200	162½	125	106¼	87½
26	78	247	208	169	130	110½	91
27	81	256½	216	175½	135	114¾	94½
28	84	266	224	182	140	119	98
29	87	275½	232	188½	145	123¼	101½
30	90	285	240	195	150	127½	105
Price, per sq. foot,		**42c.**	**42c.**	**46c.**	**50c.**	**53c.**	**57c.**

TAPPINGS:—All Radiators are tapped 2", and bushed as follows:

Containing 26 feet or under, 1 inch.
Containing above 26 feet, but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet, but not exceeding 112 feet, 1½ inch.
Containing above 112 feet, 2 inches, without bushing.

Distance from floor to center of tapping 4½ inches.

Distance from floor to center of top tapping as follows: 45", 42¼; 38", 35¼; 32", 29¼; 26", 23¼; 23", 20¼; 20", 17¼.

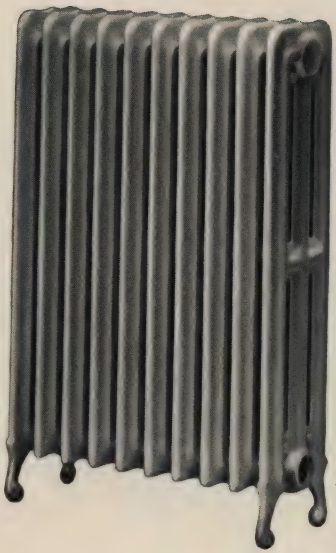
Width of section, 11 inches; width across feet, 11¾ inches.

In estimating length of Radiator, add ½" for each bushing.

Can be furnished with screw nipples if so ordered.

Radiators are made at and shipped from the plant near Pittsburg, Pa.

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushing if so ordered.



THREE COLUMN

FOR STEAM OR WATER

GRECIAN THREE COLUMN RADIATORS

No. of Sections	Length 2½ in. per section	Heating Surface—Square Feet					
		45 in. high, 6 sq. ft. per sec.	38 in. high, 5 sq. ft. per sec.	32 in. high,, 4½ sq. ft. per sec.	26 in. high, 3⅜ sq. ft. per sec.	23 in. high, 3¼ sq. ft. per sec.	20 in. high, 2⅜ sq. ft. per sec.
2	5	12	10	9	7½	6½	5½
3	7½	18	15	13½	11¼	9¾	8¼
4	10	24	20	18	15	13	11
5	12½	30	25	22½	18¾	16¼	13¾
6	15	36	30	27	22½	19½	16½
7	17½	42	35	31½	26¼	22¾	19¼
8	20	48	40	36	30	26	22
9	22½	54	45	40½	33¾	29¼	24¾
10	25	60	50	45	37½	32½	27½
11	27½	66	55	49½	41¼	35¾	30¼
12	30	72	60	54	45	39	33
13	32½	78	65	58½	48¾	42¼	35¾
14	35	84	70	63	52½	45½	38½
15	37½	90	75	67½	56¼	48¾	41¼
16	40	96	80	72	60	52	44
17	42½	102	85	76½	63¾	55¼	46¾
18	45	108	90	81	67½	58½	49½
19	47½	114	95	85½	71¼	61¾	52¼
20	50	120	100	90	75	65	55
21	52½	126	105	94½	78¾	68¼	57¾
22	55	132	110	99	82½	71½	60½
23	57½	138	115	103½	86¼	74¾	63¼
24	60	144	120	108	90	78	66
25	62½	150	125	112½	93¾	81¼	68¾
26	65	156	130	117	97½	84½	71½
27	67½	162	135	121½	101¼	87¾	74¼
28	70	168	140	126	105	91	77
29	72½	174	145	130½	108¾	94¼	79¾
30	75	180	150	135	112½	97½	82½
31	77½	186	155	139½	116¼	100¾	85¼
32	80	192	160	144	120	104	88
Price, per sq. foot.		**42c.**	**42c.**	**46c.**	**50c.**	**53c.**	**57c.**

TAPPINGS:—All Radiators are tapped 2″, and bushed as follows:
Containing 26 feet or under, 1 inch.
Containing above 26 feet but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet but not exceeding 112 feet, 1½ inch.
Containing above 112 feet, 2 inch.

In estimating length of Radiator, add ½″ for each bushing.

Width of section, 9 inches; width across feet, 9¾ inches.

Distance from floor to center of tapping, 4½ inches.

Distance from floor to center of top tapping as follows: 45″, 42¼; 38″, 35¼; 32″, 29¼; 26″, 23¼; 23″, 20¼; 20″, 17¼.

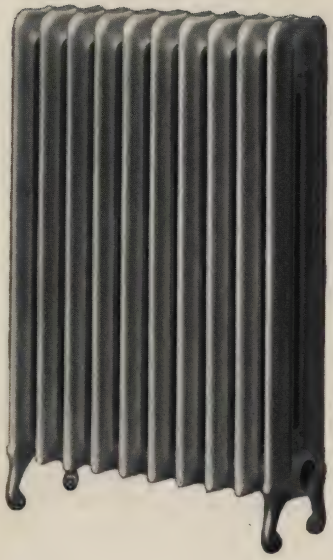
Can be furnished with screw nipples if so ordered.

Radiators are made at and shipped from the plant near Pittsburg, Pa.

Ventillating Base can be attached to the above pattern.

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushings if so ordered.

GRECIAN RADIATORS



TWO COLUMN

FOR STEAM OR WATER

GRECIAN TWO COLUMN RADIATORS

No. of Sections	Length, 2½ in. per Section	Heating Surface—Square Feet					
		45 in. high, 5 sq. ft. per sec.	38 in. high, 4 sq. ft. per sec.	32 in. high, 3½ sq. ft. per sec.	26 in. high, 2⅔ sq. ft. per sec.	23 in. high, 2½ sq. ft. per sec.	20 in. high, 2 sq. ft. per sec.
2	5	10	8	6⅔	5⅓	4⅔	4
3	7½	15	12	10	8	7	6
4	10	20	16	13⅓	10⅔	9⅓	8
5	12½	25	20	16⅔	13⅓	11⅔	10
6	15	30	24	20	16	14	12
7	17½	35	28	23⅓	18⅔	16⅓	14
8	20	40	32	26⅔	21⅓	18⅔	16
9	22½	45	36	30	24	21	18
10	25	50	40	33⅓	26⅔	23⅓	20
11	27½	55	44	36⅔	29⅓	25⅔	22
12	30	60	48	40	32	28	24
13	32½	65	52	43⅓	34⅔	30⅓	26
14	35	70	56	46⅔	37⅓	32⅔	28
15	37½	75	60	50	40	35	30
16	40	80	64	53⅓	42⅔	37⅓	32
17	42½	85	68	56⅔	45⅓	39⅔	34
18	45	90	72	60	48	42	36
19	47½	95	76	63⅓	50⅔	44⅓	38
20	50	100	80	66⅔	53⅓	46⅔	40
21	52½	105	84	70	56	49	42
22	55	110	88	73⅓	58⅔	51⅓	44
23	57½	115	92	76⅔	61⅓	53⅔	46
24	60	120	96	80	64	56	48
25	62½	125	100	83⅓	66⅔	58⅓	50
26	65	130	104	86⅔	69⅓	60⅔	52
27	67½	135	108	90	72	63	54
28	70	140	112	93⅓	74⅔	65⅓	56
29	72½	145	116	96⅔	77⅓	67⅔	58
30	75	150	120	100	80	70	60
31	77½	155	124	103⅓	82⅔	72⅓	62
32	80	160	128	106⅔	85⅓	74⅔	64
Price per sq. foot,		**42c.**	**42c.**	**46c.**	**50c.**	**53c.**	**57c**

TAPPINGS:—All Radiators are tapped 2", and bushed as follows:
Containing 26 feet or under, 1 inch.
Containing above 26 feet but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet but not exceeding 112 feet, 1½ inch.
Containing above 112 feet, 2 inches without bushing.

In estimating length of Radiator, add ½" for each bushing.

Width of section, 7¾ inches; width across feet, 8¼ inches.

Distance from floor to center of tapping, 4½ inches.

Distance from floor to center of top tapping as follows: 45", 42¼; 38", 35¼; 32". 29¼; 26", 23¼; 23", 20¼; 20", 17¼.

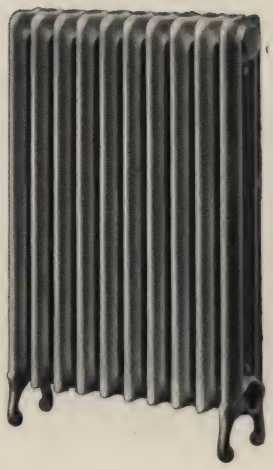
Can be furnished with screw nipples if so ordered.

Radiators are made at and shipped from the plant near Pittsburg, Pa.

Ventilating Base can be attached to the above pattern.

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushings if so ordered.

GRECIAN RADIATORS



SINGLE COLUMN

FOR STEAM OR WATER

GRECIAN SINGLE COLUMN RADIATORS

No. of Sections	Length, 2½ in. per Section	Heating Surface—Square Feet				
		38 in. high, 3 sq. ft. per sec.	32 in. high, 2½ sq. ft. per sec.	26 in. high, 2 sq. ft. per sec.	23 in. high, 1⅔ sq. ft. per sec.	20 in. high, 1½ sq. ft. per sec.
2	5	6	5	4	3⅓	3
3	7½	9	7½	6	5	4½
4	10	12	10	8	6⅔	6
5	12½	15	12½	10	8⅓	7½
6	15	18	15	12	10	9
7	17½	21	17½	14	11⅔	10½
8	20	24	20	16	13⅓	12
9	22½	27	22½	18	15	13½
10	25	30	25	20	16⅔	15
11	27½	33	27½	22	18⅓	16½
12	30	36	30	24	20	18
13	32½	39	32½	26	21⅔	19½
14	35	42	35	28	23⅓	21
15	37½	45	37½	30	25	22½
16	40	48	40	32	26⅔	24
17	42½	51	42½	34	28⅓	25½
18	45	54	45	36	30	27
19	47½	57	47½	38	31⅔	28½
20	50	60	50	40	33⅓	30
21	52½	63	52½	42	35	31½
22	55	66	55	44	36⅔	33
23	57½	69	57½	46	38⅓	34½
24	60	72	60	48	40	36
25	62½	75	62½	50	41⅔	37½
26	65	78	65	52	43⅓	39
27	67½	81	67½	54	45	40½
28	70	84	70	56	46⅔	42
29	72½	87	72½	58	48⅓	43½
30	75	90	75	60	50	45
31	77½	93	77½	62	51⅔	46½
32	80	96	80	64	53⅓	48
Price, per sq. foot,		**42c.**	**46c.**	**50c.**	**53c.**	**57c.**

TAPPINGS:—All single column Radiators are tapped 1½", and bushed as follows:

Containing 26 feet or under, 1 inch.
Containing above 26 feet but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet but not exceeding 112 feet, 1½ inch.

Add ½" to length for each bushing.

Width of section, 7 inches; width across feet, 7 inches.

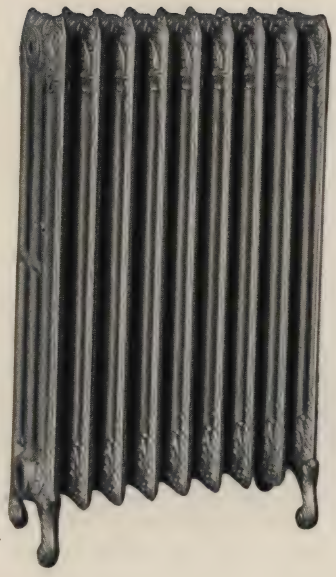
Distance from floor to center of tapping, 4½ inches.

Distance from floor to center of top tapping as follows: 45", 42¼; 38" 35¼; 32", 29¼; 26", 23¼; 23", 20¼; 20", 17¼.

Can be furnished with screw nipples if so ordered.

Radiators are made at and shipped from the plant near Pittsburg, Pa.

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushings if so ordered.



THREE COLUMN

FOR STEAM OR WATER

MERCURY THREE COLUMN RADIATORS

No. of Sections	Length, 2⅛ in. per section	Heating Surface—Square Feet					
		45 in. high, 6 sq. ft. per sec.	38 in. high, 5 sq. ft. per sec.	32 in. high, 4½ sq. ft. per sec.	26 in. high, 3¾ sq. ft. per sec.	23 in. high, 3¼ sq. ft. per sec.	20 in. high, 2¾ sq. ft. per sec.
2	5	12	10	9	7½	6½	5½
3	7½	18	15	13½	11¼	9¾	8¼
4	10	24	20	18	15	13	11
5	12½	30	25	22½	18¾	16¼	13¾
6	15	36	30	27	22½	19½	16½
7	17½	42	35	31½	26¼	22¾	19¼
8	20	48	40	36	30	26	22
9	22½	54	45	40½	33¾	29¼	24¾
10	25	60	50	45	37½	32½	27½
11	27½	66	55	49½	41¼	35¾	30¼
12	30	72	60	54	45	39	33
13	32½	78	65	58½	48¾	42¼	35¾
14	35	84	70	63	52½	45½	38½
15	37½	90	75	67½	56¼	48¾	41¼
16	40	96	80	72	60	52	44
17	42½	102	85	76½	63¾	55¼	46¾
18	45	108	90	81	67½	58½	49½
19	47½	114	95	85½	71¼	61¾	52¼
20	50	120	100	90	75	65	55
21	52½	126	105	94½	78¾	68¼	57¾
22	55	132	110	99	82½	71½	60½
23	57½	138	115	103½	86¼	74¾	63¼
24	60	144	120	108	90	78	66
25	62½	150	125	112½	93¾	81¼	68¾
26	65	156	130	117	97½	84½	71½
27	67½	162	135	121½	101¼	87¾	74¼
28	70	168	140	126	105	91	77
29	72½	174	145	130½	108¾	94¼	79¾
30	75	180	150	135	112½	97½	82½
31	77½	186	155	139½	116¼	100¾	85¼
32	80	192	160	144	120	104	88
Price per sq. foot.		**42c.**	**42c.**	**46c.**	**50c.**	**53c.**	**57c.**

TAPPINGS:—All Radiators are tapped 2″, and bushed as follows:
Containing 26 feet or under, 1 inch.
Containing above 26 feet but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet but not exceeding 112 feet, 1½ inch.
Containing above 112 feet, 2 inches without bushing.

In estimating length of Radiator, add ½″ for each bushing.

Width of section, 9 inches; width across feet, 9¾ inches.

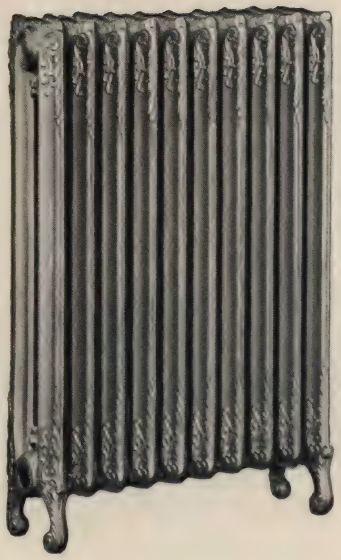
Distance from floor to center of tapping, 4½ inches.

Distance from floor to center of top tapping as follows: 45″, 42¼; 38″, 35¼; 32″, 29¼; 26″, 23¼; 23″, 20¼; 20″, 17¼.

Can be furnished with screw nipple if so ordered.

Radiators are made at and shipped from the plant near Pittsburg, Pa., and at Corry, Pa.

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushings if so ordered.



TWO COLUMN

FOR STEAM OR WATER

MERCURY TWO COLUMN RADIATORS

No. of Sections	Length, 2½ in. per section	Heating Surface—Square Feet					
		45 in. high, 5 sq. ft. per sec.	38 in. high, 4 sq. ft. per sec.	32 in. high, 3⅓ sq. ft. per sec.	26 in. high, 2⅔ sq. ft. per sec.	23 in. high, 2⅓ sq. ft. per sec.	20 in. high, 2 sq. ft. per sec.
2	5	10	8	6⅔	5⅓	4⅔	4
3	7½	15	12	10	8	7	6
4	10	20	16	13⅓	10⅔	9⅓	8
5	12½	25	20	16⅔	13⅓	11⅔	10
6	15	30	24	20	16	14	12
7	17½	35	28	23⅓	18⅔	16⅓	14
8	20	40	32	26⅔	21⅓	18⅔	16
9	22½	45	36	30	24	21	18
10	25	50	40	33⅓	26⅔	23⅓	20
11	27½	55	44	36⅔	29⅓	25⅔	22
12	30	60	48	40	32	28	24
13	32½	65	52	43⅓	34⅔	30⅓	26
14	35	70	56	46⅔	37⅓	32⅔	28
15	37½	75	60	50	40	35	30
16	40	80	64	53⅓	42⅔	37⅓	32
17	42½	85	68	56⅔	45⅓	39⅔	34
18	45	90	72	60	48	42	36
19	47½	95	76	63⅓	50⅔	44⅓	38
20	50	100	80	66⅔	53⅓	46⅔	40
21	52½	105	84	70	56	49	42
22	55	110	88	73⅓	58⅔	51⅓	44
23	57½	115	92	76⅔	61⅓	53⅔	46
24	60	120	96	80	64	56	48
25	62½	125	100	83⅓	66⅔	58⅓	50
26	65	130	104	86⅔	69⅓	60⅔	52
27	67½	135	108	90	72	63	54
28	70	140	112	93⅓	74⅔	65⅓	56
29	72½	145	116	96⅔	77⅓	67⅔	58
30	75	150	120	100	80	70	60
31	77½	155	124	103⅓	82⅔	72⅓	62
32	80	160	128	106⅔	85⅓	74⅔	64
Price, per sq. foot,		**42c.**	**42c.**	**46c.**	**50c.**	**53c.**	**57c.**

TAPPINGS:—All Radiators are tapped 2″, and bushed as follows:
Containing 26 feet or under, 1 inch.
Containing above 26 feet but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet but not exceeding 112 feet, 1½ inch.
Containing above 112 feet, 2 inches without bushing.

In estimating length of Radiator, add ½″ for each bushing.
Width of section, 7¾ inches; width across feet, 8¼ inches.
Distance from floor to center of tapping, 4½ inches.
Distance from floor to center of top tapping as follows: 45″, 42¼; 38″, 35¼; 32″, 29¼; 26″, 23¼; 23″, 20¼; 20″, 17¼.
Can be furnished with screw nipples if so ordered.

Radiators are made at and shipped from the plant near Pittsburg, Pa., and at Corry, Pa.
Ventilating Base can be attached to the above pattern.

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushings if so ordered.

A Six Column Radiator for windows and seats.

Can be made curved or angle to suit the various forms of rooms or spaces. See pages 71, 86.

UTILITY RADIATORS

No. of Sections	Length 3 in. per section	Heating Surface—Square Feet				
		26 in. high, 7 sq. ft. per sec.	22 in. high, 6 sq. ft. per sec.	18 in. high, 5 sq. ft. per sec.	14 in. high, 4 sq. ft. per sec.	13 in. high, 4 sq. ft. per sec.
2	6	14	12	10	8	8
3	9	21	18	15	12	12
4	12	28	24	20	16	16
5	15	35	30	25	20	20
6	18	42	36	30	24	24
7	21	49	42	35	28	28
8	24	56	48	40	32	32
9	27	63	54	45	36	36
10	30	70	60	50	40	40
11	33	77	66	55	44	44
12	36	84	72	60	48	48
13	39	91	78	65	52	52
14	42	98	84	70	56	56
15	45	105	90	75	60	60
16	48	112	96	80	64	64
17	51	119	102	85	68	68
18	54	126	108	90	72	72
19	57	133	114	95	76	76
20	60	140	120	100	80	80
21	63	147	126	105	84	84
22	66	154	132	110	88	88
23	69	161	138	115	92	92
24	72	168	144	120	96	96
25	75	175	150	125	100	100
26	78	182	156	130	104	104
27	81	189	162	135	108	108
28	84	196	168	140	112	112
29	87	203	174	145	116	116
30	90	210	180	150	120	120
Price per sq. foot,		**50c.**	**53c.**	**58c.**	**64c.**	**66c.**

TAPPINGS:—All Radiators are tapped 2″, and bushed as follows:

Containing 26 feet or under, 1 inch.
Containing above 26 feet but not exceeding 60 feet, 1¼ inch.
Containing above 60 feet but not exceeding 112 feet, 1½ inch.
Containing above 112 feet, 2 inches without bushing.

In estimating length of Radiator, add ½″ for each bushing.

Width of section, 11¼ inches; width across feet, 11¼ inches.

Distance from floor to center of tapping, 3½ inches.

Distance from floor to center of top tapping 26″, 22″, 18″, 14″, 13″.

In 13-inch size, distances are 1 inch less.

Radiators are made at and shipped from the plant near Pittsburg, Pa.

NOTE.—In ordering, always mention whether for steam or water, and if for steam, whether for one or two pipe, or for atmospheric or vapor system. For steam, one pipe tapping will be regularly supplied, unless otherwise ordered. Single pipe tappings may be made solid without bushings if so ordered.

CONCEALED BRACKETS FOR COLUMN WALL RADIATORS

We herewith present our system of Concealed Brackets for Wall Radiators, the advantages of which are easily apparent. By this method the engineer can place our Radiators in any position on the wall, thereby securing harmony and effect. This mode also does away with some of the greatest objections a housekeeper has to Radiators —that they cannot be swept under, that the carpets have to be cut to fit under them, etc.

As the above illustration denotes, these Wall Brackets come in sets, each containing four parts—two upper and two lower.

Set of Three Column Brackets, $1.80; set of Two Column Brackets, $1.50; set of Single Column Brackets, $.80.

Radiators with eighteen sections or more require a set and a half of brackets.

Illustrating two column with our system of setting up with Concealed Brackets.

Brackets are made for the Roman Three Column, Roman Two Column, Roman Single Column, Mercury Three Column, Mercury Two Column, Grecian Four Column, Grecian Three Column, Grecian Two Column, and Grecian Single Column.

ROMAN DINING ROOM RADIATORS

FOR STEAM OR WATER

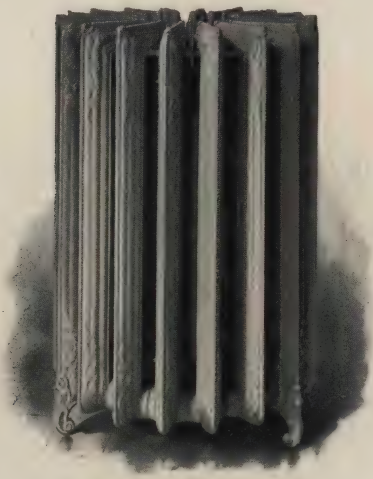
DIMENSIONS AND PRICES

No.	Length in Inches	Heating Surface Square Feet	Price for Water	Price for Steam
1	30	43½	$50 00	$46 00
2	35	54½	55 00	50 00
3	40	65½	60 00	54 00
4	45	76½	65 00	58 00
5	50	87½	70 00	62 00
6	55	98½	75 00	66 00
7	60	109½	80 00	70 00
8	65	120½	85 00	74 00
9	70	131½	90 00	78 00
10	75	142½	95 00	82 00

A useful device for the warming of plates, etc., and heating the room at the same time. Made in Three Column pattern only. Ovens are all the same size, 24x11x16 inches. Height of Radiator complete 38½ inches.

ROMAN CIRCULAR RADIATORS

FOR STEAM OR WATER



DIMENSIONS

TWO COLUMN			THREE COLUMN		
No. of Sec.	Inside Diameter at Legs	Outside Diameter at Legs	No. of Sec.	Inside Diameter at Legs	Outside Diameter at Legs
16	6½	23½	16	4½	25
18	8½	25½	18	6½	27
20	10¼	27¼	20	8¼	28¾
22	12¼	29¼	22	10¼	30¾
24	14½	31	24	11½	32½
26	15½	32½	26	12¾	33¼
28	17	34	28	14½	35
30	18½	35½	30	16¼	36¾
32	20	37	32	18	38½
34	21½	38½	34	19¾	40¼
36	22¼	39¼	36	21½	42
38	25	42	38	23¼	43¾
40	26½	43½			

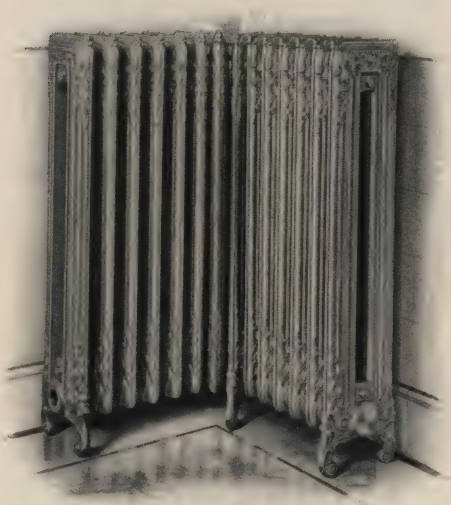
This is one of our special patterns. Circular Radiators are made in all the heights of each pattern. No less number of sections than given in list above can be used to form a complete circle. In ordering, always state whether Circular or if they are to fit around a column, as Circular Radiators are generally made in one piece, but Column Radiators are made in two pieces; also state if wanted for marble top.

Column or Circular Radiators cannot be tapped larger than 1½ inch.

ROMAN CORNER RADIATORS

TWO COLUMN

FOR STEAM OR WATER



DESCRIPTION

Four sections are needed to turn a corner, and as many regular sections may be added as required.

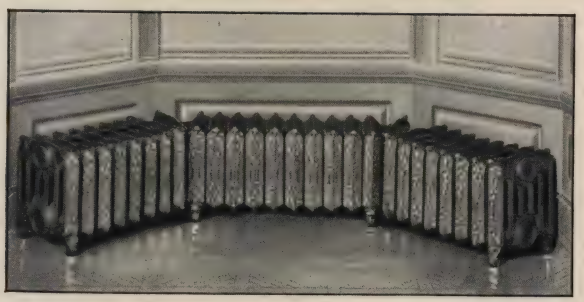
This is one of our special radiators, and is made in regular heights of Roman, Grecian, Mercury and Utility patterns.

Space occupied by the four corner sections each way from the corner of the room:

12½ inches for Three Column Radiators.
12 inches for Two Column Radiators.
10½ inches for Single Column Radiators.
20½ inches for the Utility and Four Column Grecian Radiators.

In ordering Curved or Corner Radiators, always state which is the feed end as you face the Radiator when in position, as shown by above cut.

UTILITY ANGLE RADIATORS

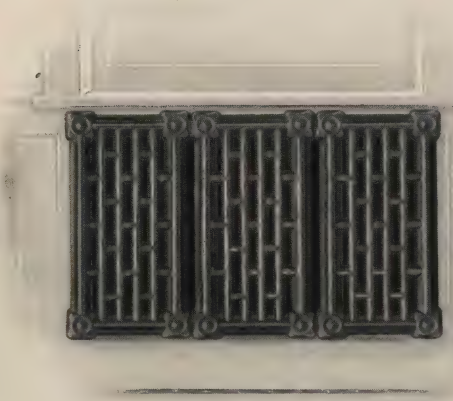


Arranged for a bay window, either with or without a seat. Can be made any size to suit the room.

Template of angles must always be sent with order; state which is feed end, right or left, as you face the Radiator, when in position as shown in cut.

A Radiator for such a space should be made as two Radiators, owing to the difficulty of shipping it in one piece and getting it to destination without being strained or twisted. The two Radiators may be connected together by a close nipple at the bottom and used as one Radiator with feed at one end and return at the other. An air valve should, however, be placed on each part.

ATHENIAN WALL RADIATORS

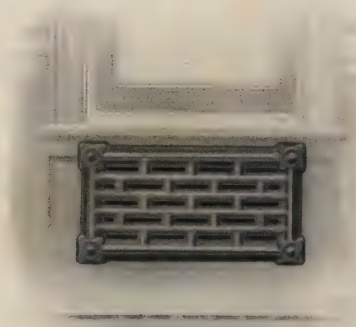


Athenian Wall Radiators are made to fit on walls to heat rooms where floor space cannot be spared. They are particularly adapted for small rooms, narrow halls, bath rooms, and state rooms on ships; also on basement walls where it is necessary to put the Radiators near the ceiling to keep them above the boiler which may be on the same floor.

The Radiators are 3 inches deep and when set on the brackets, project about 3¾ inches from the wall. The brackets to hold the Radiators may be set at any height to suit the conditions.

These Radiators may be set horizontally or vertically as the conditions require, or they may be hung from the ceiling if no wall space is available.

The plain character of the surface enables them to be used with any style of decoration without being out of harmony with their surroundings.



Athenian Wall Radiators are made in sections of three different lengths. The large size containing 9 square feet per section measures 29¼ inches long, 13¼ inches wide, 3 inches thick.

The standard size measures 24¼ inches long, 13¼ inches wide, 3 inches thick, and contains 7 square feet of heating surface.

The small size contains 5 square feet of heating surface per section and measures 19¼ inches long, 13¼ inches wide, 3 inches thick. The sections are connected together by 1½ inch right and left inside nipples. On the inside of these nipples are cast two lugs which will accomodate any flat-ended tool; a bar of 1 x ⅜ inch iron will answer the purpose, or it is better to have a key about 5 feet long, made of 1 in. round iron, with a tee at one end for a handle, and the other end flattened to fit the nipple.

TAPPING INFORMATION

All Athenian Wall Radiators are tapped 1½ inch, one end right and the other end left as shown in the illustrations but they are plugged or bushed to the following sizes and the inside threads of all bushings are right hand.

When ordering these radiators it is necessary to send a sketch showing how the radiators are to be set up and to state the location for the openings in which the feed and return pipes are to be connected. If proper attention is given to this, labor and fittings can often be saved by ordering the radiators to suit the building in which they are to be installed.

Note particularly the illustration on page 76, Fig. 2. which gives the tappings as A, B, C, D, E, F, G, and H. When ordering vertical radiators state what letters on this cut represent tappings required. When ordering horizontal radiators state what letters as shown on cut Fig. 6, page 77, represent tappings required.

Should no instructions, as to tappings, accompany the order, we would ship radiator with regular tappings, which would be one at each end, at the bottom.

SINGLE PIPE STEAM

All radiators or sections up to 21 feet, 1 inch.

All above 21 feet and up to 56 feet, 1¼ inch.

All above this size will be 1½ inch as shown in the illustrations and referred to by figure numbers on pages 76 and 77.

SHIPPING INFORMATION

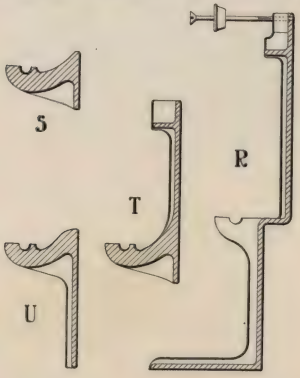
When assembled horizontally as shown in figures 3 and 5, three sections only can be put together for shipping purposes. When assembled vertically as in Figure 4, five sections may be put together, but it is better to ship them four to the piece.

We provide a right and left threaded nipple having a hexagon nut to connect the parts.

We carry in stock tapped sections for both horizontal and vertical setting, but they are not interchangable, hence to avoid mistakes it is necessary to clearly state what is wanted.

If you can designate what you want by one of the figure numbers, do so, but if you cannot, make a sketch showing whether the sections are to set horizontally or vertically, and how you wish the openings tapped for connections.

ATHENIAN RADIATOR BRACKETS



To fit over the base board of a room, we provide brackets with feet to rest on the floor. Such brackets are designated as R Brackets, but they are made in different heights to suit different base boards and in addition to the letter R, they have a number to show the height, which must always be given when ordering.

The S and T Brackets may be utilized wherever these Radiators can be used; the S being used at the top and the T at the bottom.

The U Bracket is used on a base board when the Radiator is set near the floor and where there would not be room for the T Bracket. S Brackets may be used to fasten the top, or a long screw and washer may be used between the loops if preferred.

SIZE OF BRACKETS

R No. 1 to fit 10½" Base, Height of Tapping from floor, 11½"
R No. 2 " 8½" " " " " " 9½"
R No. 3 " 6½" " " " " " 7½"

PRICE OF BRACKETS

R No. 1, 44c. R No. 2, 42c. R No. 3, 40c. S, T & U Brackets, 10c. each.

When ordering the Radiators, be sure to state which Brackets are wanted. Brackets are not included in the price of the Radiators.

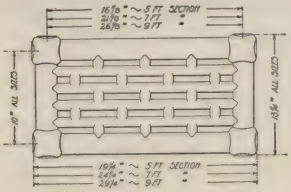


FIG. 1.

Giving dimensions.

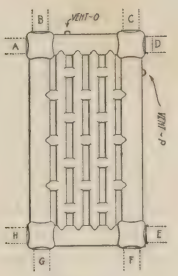


FIG. 2.

Showing vertical sections assembled vertically or one above the other in a single tier. Can also be assembled in two or more vertical tiers.

Designate tappings by letters shown in Fig. 2.

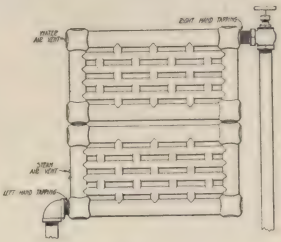


FIG 3.

Showing horizontal sections assembled vertically. Cut shows two, but any number can be assembled.

Designate tappings by letters shown in figure 6.

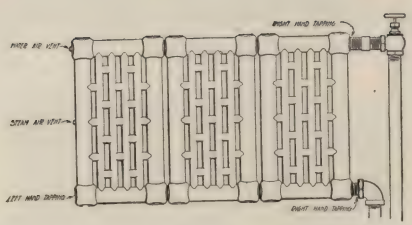


FIG. 4.

Showing vertical sections assembled horizontally. Can also be assembled in two or more tiers, one above the other.

Designate tappings by letters shown in Fig. 2.

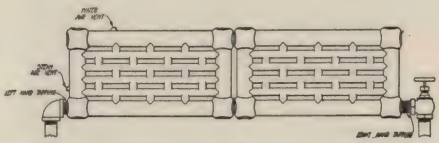


FIG. 5.

Showing horizontal sections assembled horizontally in a single tier. Can also be assembled in two or more tiers, of any length.

Designate tappings by letters shown in Fig. 6.

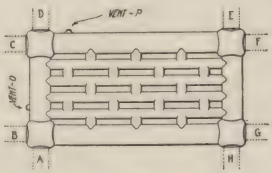


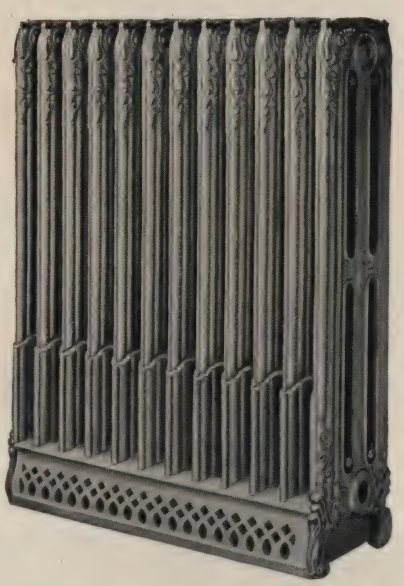
FIG. 6.

Showing horizontal Section.

Designate tappings by letters shown in Fig. 6.

DIRECT-INDIRECT RADIATORS

FOR STEAM OR WATER



The above cut illustrates the Three Column Roman Radiator with ventilating base attached. Bases made also for Two Column Roman, Grecian or Mercury, either two or three column pattern.

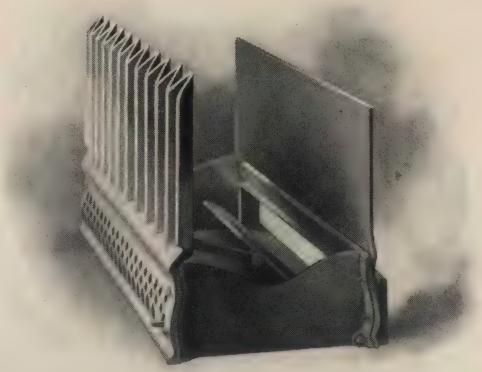
The base is bolted to a regular radiator, and is far superior to flue radiation, as it allows three times as much air to pass between the sections. It is a ventilating radiator, which is not true of the ordinary flue radiator through which sufficient air cannot pass to be of any actual value. The bases may be added to or taken from a radiator at any time, even while it is in use, without disconnecting pipes. The upper part of base is made up of separate panels between the sections, bolted through to the back.

They are made to take in the air at the back of radiator above the floor, but it may be brought in from below the floor, a floor damper being used as illustrated on page 81.

In ordering it should always be clearly stated which way the air is to be brought in, whether from under the floor or at the back of the radiator above the floor. If no directions are given, the regular pattern with collar above floor will be sent.

ROMAN DIRECT-INDIRECT RADIATORS

BASE DETACHED



PRICES AND DIMENSIONS

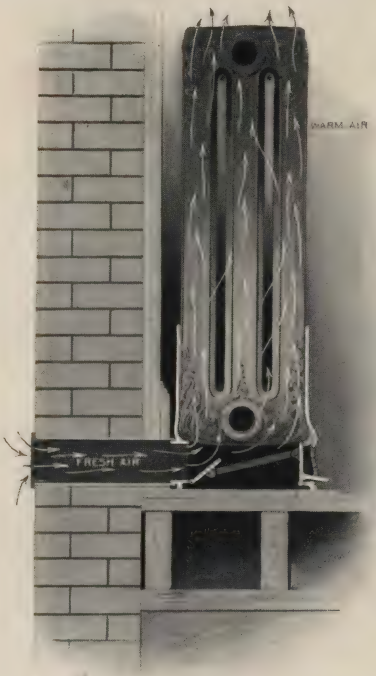
Size of Radiator	Outside of Flange around Back Air Inlet for attaching Sheet Iron Duct	Size of Radiator	Outside of Flange around Back Air Inlet for attaching Sheet Iron Duct
5 Sections	8½ × 3¼	12 Sections	21¾ × 3¼
6 Sections	8½ × 3¼	13 Sections	21¾ × 3¼
7 Sections	12½ × 3¼	14 Sections	21¾ × 3¼
8 Sections	12½ × 3¼	15 Sections	21¾ × 3¼
9 Sections	17½ × 3¼	16 Sections	21¾ × 3¼
10 Sections	17½ × 3¼	17 Sections	21¾ × 3¼
11 Sections	17½ × 3¼		

All Radiators of 18 or more sections may be fitted with two bases, one on either side of middle leg section; or a small base may be placed under center of Radiator, using two intermediate leg sections, one at either end of base. This applies to floor damper also. In ordering, it should always be clearly stated which construction is wanted.

A small box can also be used in a long Radiator, and a full length front panel used to give the Radiator a presentable appearance. Care should be taken in writing an order for these goods.

ROMAN DIRECT-INDIRECT RADIATOR

SECTION SHOWING METHOD OF INSTALLATION



For Steam or Water

The above illustration shows how the fresh air, from out-doors, is taken in and heated before it passes into the room.

The double damper shows how circulation from the room is established when outside air is closed off.

Cold air may be taken under the floor and brought up under the radiator, in which case we use a floor damper as shown on page 81 in place of the base damper.

ROMAN WALL BOX FOR DIRECT-INDIRECT RADIATORS

DIMENSIONS AND PRICES

For Direct-Indirect Bases	From 5 to 6 sections inclusive	From 7 to 8 sections inclusive	From 9 to 11 sections inclusive	From 12 to 17 sections inclusive
Size opening in brick work	8½×5	12½×5	17½×5	21¾×5
Size of collar for galv. iron	8½×3¼	12½×3¼	17½×3¼	21¾×3¼
List price, each, cast iron	$2 00	$ 2 50	$ 3 00	$ 3 50
List price, each, galvanized	3 50	4 00	4 50	5 00
List price, each, bronze face	5 00	7 00	9 00	11 00
List price, each, all bronze	10 00	12 50	15 00	17 50

A perfect device for letting in fresh air and keeping out snow or rain. Openings in the Wall Boxes are uniform with the size of openings in the Radiator bases.

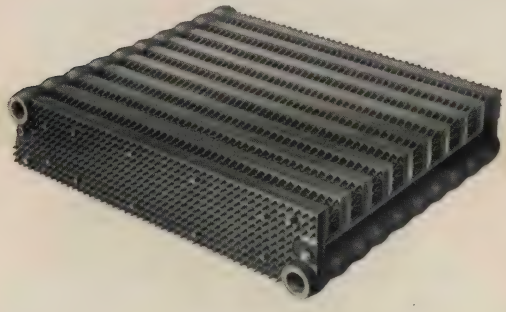
ROMAN RADIATOR FLOOR DAMPER

For direct-indirect fresh air openings entering under Radiator

Size of Radiator Floor Damper	8½×13½	8½×15½	8½×19½	8½×23½	8½×29½	8½×36½
Area of fresh air opening in sq. in.	18	26	34	45	65	85
Prices, floor dampers	$ 1 50	$ 1 75	$ 2 00	$ 2 25	$ 2 50	$ 2 75

When ordering, be sure to order proper size to correspond with base wanted.

ROMAN PIN INDIRECT RADIATORS



DIMENSIONS

10 FOOT SECTION

Length of section	36	inches
Depth of section	7 5/8	inches
Depth from out to out of hubs	8 5/8	inches
Distance from center to center, push nipple	3	inches
Distance from center to center, screw nipple	4	inches
Price per section	$2.70	

15 FOOT SECTION

Length of section	36	inches
Depth of section	10 5/8	inches
Depth from out to out of hubs	11 5/8	inches
Distance from center to center, push nipple	3	inches
Distance from center to center, screw nipple	4	inches
Price per section	$4.05	

Regular stock is made with push nipple joints. Screw nipple joints with hex. nut, R & L nipples are also supplied if desired. Space between the sections, 2 inches, can be increased to 2½ inches if desired, for special order.

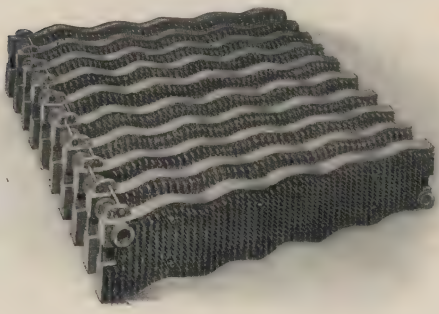
In ordering Indirect Radiators, always specify the number of sections in each stack, so that the proper end sections and proper length bolts may be supplied.

The regular tapping for these radiators is 1½ x 1½ in.

It is always better to order these radiators made up in stacks, as the fitter will save time in putting up, and it enables us to test the stack complete. If the stack is too large to handle, it can be separated in two or three parts, at the building, and when in place can easily be bolted together.

ROMAN SCHOOL INDIRECT RADIATORS

FOR STEAM OR WATER



20 FOOT SECTION

Length of section	42	inches
Depth of section	12	inches
Depth from out to out of hubs	12⅝	inches
Distance from center to center, push nipple	4	inches
Distance from center to center, screw nipple	5	inches
Price per section	$5.40	

When ordering Indirect Radiators, always specify the number of stacks needed, so that the proper number of end sections may be shipped, and also the number of sections in each stack, that proper bolts may be sent. These radiators are put together with long bolts, not short bolts as shown in cut.

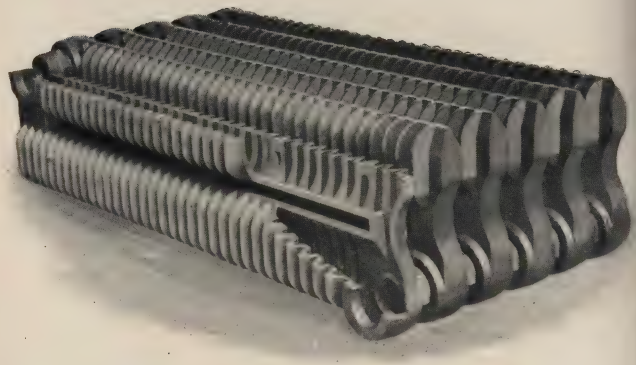
Regular stock is made for push nipple joints. Screw nipple joints with hex. nut, R & L nipples are supplied if desired.

Spaces between sections are 2½ inches permitting a large volume of air, for ventilation, to pass between the sections.

Regular tapping for these radiators is 2 x 2 inches.

When ordering push nipple pattern it is best to assemble the stacks before shipping. The fitter will save time in putting up, and we can test the stack complete. If the stack is too large to handle, it can be separated in two or three parts at the building, and when in place can be easily drawn together.

ROMAN CHAMPION INDIRECT RADIATORS



Prime surface, ten feet per section.

For steam, with one connection. For water, with connection at each end.

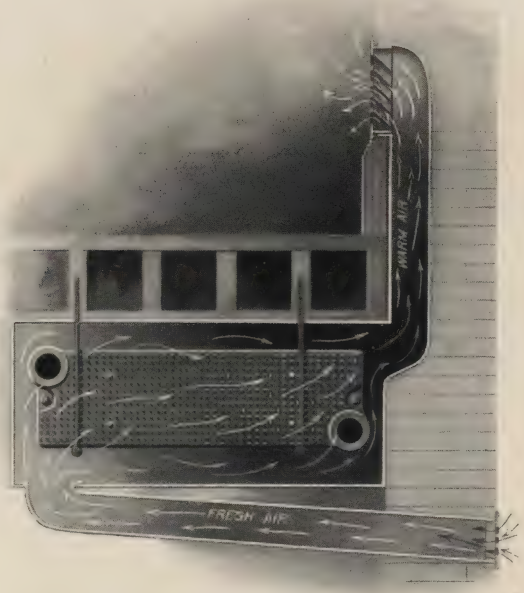
Length of section	36½ inches
Height of section	9⅛ inches
Height across hubs	10¾ inches
Distance from center to center	3 inches

Price per section $2.70

Connnections are made with R & L hex. nut nipples.

Regular tapping at flow and return is 2 inches and can be bushed to suit requirements.

Shipped in separate sections unless ordered assembled. Charges for assembling, one cent per foot.



The above illustration shows how the fresh air is taken in and passed through the radiator before having circulated to the room. There should always be a space of 10 inches above and 10 inches below the radiator to allow for circulation of air.

This method can be arranged to give any desired amount of fresh warm air and can be resorted to in buildings where there is an objection to placing radiators in the rooms.

The cost of installation and operation is more than for the direct radiator system, but the advantages often warrant the additional cost.

Any of the Roman Indirect Radiators can be adapted to this system for either steam or water.

RADIATOR PRICE LIST

FOR ALL DIRECT RADIATORS

Height - -	45 in.	38 in.	32 in.	26 in.	23 in.
Price, per foot -	.42	.42	.46	.50	.53
Height - -	22 in.	20 in.	18 in.	14 in.	13 in.
Price, per foot -	.53	.57	.58	.64	.66

Athenian Wall Radiators and Brackets, see page 75.

SPECIALTIES, EXTRA PER SECTION

	Column or Curved	Window	Stairway
Steam	.58	.16	.34
Water	.92	.32	.68

High or low legs up to 9 in. from center of tapping to floor, or radiators without legs, 53 cents per section, special.

	Saddles for Marble Tops, per pair	Wall Brackets per pair	Direct-Indirect Base, per Section
Steam	$1 00	1 Col. $ 80	.50
Water	1 00	2 " 1 50	.50
		3 " 1 80	

When Direct-Indirect base is supplied without damper, a deduction of 5 cents net per section is made.

Dowel Pins for Marble Tops, per rack, $ 50
Corner, extra per Radiator, for Steam, 4 00
Corner, extra per Radiator, for Water, 4 50

PRICE LIST OF INDIRECT RADIATORS

Roman Pin Indirect, 10 square feet per section - -	$2 70
" " " 15 " " " " - - - -	4 05
" " " 20 " " " " - - - -	5 40
Roman Champion Prime Surface, per section - - - -	2 70

Note.—All Indirect Radiators may be made up into stacks, if so desired, at a uniform charge of one cent per foot, net.

Unless otherwise ordered, Indirect Radiators are shipped in separate sections with bolts for putting together.

When ordering Indirect Radiators, always specify the number of stacks needed, so that the proper number of end sections may be shipped, and also the number of sections in each stack, that proper bolts may be sent.

SPECIAL NOTICE RE ORDERING RADIATORS

If tappings other than regular are needed, it should be so stated on the order. This is particularly requested in case the location of the tapping is changed. It is better to send a sketch with order showing clearly what is desired as to position of outlets or inlets.

All radiators will be made for the bushing system, bushed with right-hand threads, and the sizes given at the bottom of each radiator list as follows: All up to 26 feet, tapped 1 inch; all above 26 feet and up to 60 feet, 1¼ inches; all above 60 feet and up to 112 feet, 1½ inches; and all above 112 feet 2, inches. If tappings are wanted for a special system, it should be so stated. Single column radiators are tapped 1½ inch only, and bushed to size.

The schedule for tappings will be the same for water, single or two-pipe steam; but in the case of two-pipe steam, the return will be tapped one size smaller.

Add ½ inch to length of radiator for each bushing used.

TOP FEED TAPPINGS IN ALL CASES WILL BE OF THE FOLLOWING HEIGHTS FROM FLOOR TO CENTER OF TAPPINGS:

Height of Radiator	45 in.	38 in.	32 in.	26 in.	23 in.	20 in.
Four Col. Grecian	42¼″	35¼″	29¼″	23¼″	20¼″	17¼″
Three " "	42½″	35¼″	29¼″	23¼″	20¼″	17¼″
Two " "	42¼″	35¼″	29¼″	23¼″	20¼″	17¼″
Single " "	42¼″	35¼″	29¼″	23¼″	20¼″	17¼″
Three Col. Roman	42½″	35½″	29½″	23½″		17½″
Two " "	42½″	36⅛″	30⅛″	24⅛″		18⅛″
Single " "		35¾″	30″	24″		

Mercury has same top tapping as Grecian.

18″ Single Column Roman, 15¾ inches

Height of Radiator	26 in.	22 in.	18 in.	14 in.	13 in.
Utility Pattern	24″	20″	16″	12″	11″

SPECIAL NOTICE RE ORDERING RADIATORS

In ordering Curved or Corner Radiators, always mark which is the feed end as you face the radiator when in position. Radiators with feed and return at same end can be furnished if desired.

All Direct Radiators are tapped 2-inch, and bushed to size required, except Single Column which is 1½ inches.

To set up Roman Wall or Grecian Radiators, it is necessary to put up a wood plate on wall above the base board, to come flush with it. See that this base is securely fastened to a stud in the partition, and the radiator will be as firm as if set on legs. Radiators will be made with legs of any height that may be required, at an additional price, as given on page 86.

When ordering Indirect Radiators, always specify the number of stacks needed, that the proper number of end sections may be shipped.

SHIPMENTS

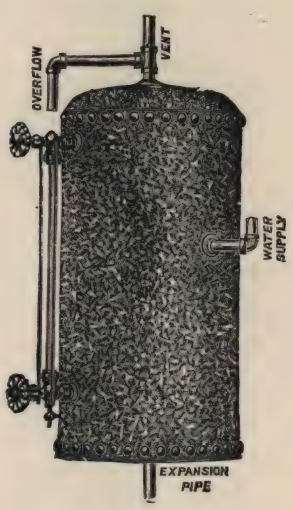
All boilers and radiators are shipped from the factory near Pittsburg, Pa., (one of the best shipping points in the United States). Carload rate of freight will be allowed on all radiators, to points where such rate does not exceed 30 cents per hundred pounds. Freight is also allowed to equal F. O. B. Boston, New York, Philadelphia, Chicago, Minneapolis or St. Louis. Large stocks are carried in warehouses at New York for quick shipments. We do not replace radiators broken in transit. In all such cases our customers are expected to look to the carriers for any damage they may sustain. In case of a defective casting, we furnish one to replace it free of charge, but we will not allow bills for labor in replacing such casting.

ORDER PADS AND ADVERTISING

All our customers should have a pad of our special order blanks; having same, it will lessen your work and obviate mistakes. These pads will be mailed promptly upon request. We might also add, that in order to foster trade and to assist the fitter in every way possible, we furnish printed matter, relating to our goods, in liberal quantities to the trade.

GALVANIZED STEEL EXPANSION TANKS

TESTED TO 50 POUNDS PRESSURE



DIMENSIONS AND PRICES

Capacity Gallons	Size	Square feet of Radiation	Price of Tank	Price of Gauge
8	10 × 20	300	$ 7 50	$ 1 75
10	12 × 20	400	8 00	1 75
12	12 × 24	500	8 50	1 75
15	12 × 30	600	9 00	1 75
18	12 × 36	700	11 00	1 75
20	14 × 30	1000	12 50	1 75
26	16 × 30	1400	14 00	1 75
32	16 × 36	2000	15 00	1 75
42	16 × 48	2800	16 50	1 75
66	18 × 60	4000	31 00	1 75
82	20 × 60	6000	37 00	1 75
100	22 × 60	8000	51 00	1 75
120	24 × 60	11000	60 00	1 75

STEAM RADIATOR VALVES

STEAM RADIATOR VALVES, COMPOSITION DISC, NICKEL-PLATED ALL OVER

WITH UNION

Size	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
Price	$3 80	$4 75	$6 40	$8 10	$13 10

WITHOUT UNION

Size	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
Price	$2 85	$3 65	$4 90	$6 75	$11 00

OFFSET CORNER STEAM RADIATOR VALVES, NICKEL-PLATED ALL OVER

WITH UNION

Size	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
Price	$4 20	$5 25	$7 05	$8 95	$14 45

WITHOUT UNION

Size	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
Price	$3 15	$4 00	$5 50	$7 50	$12 10

When ordering Corner Valves be sure to state which side of the radiator they are to fit as they are made for right or left side as you face the radiator.

QUICK OPENING WATER RADIATOR VALVES

WITH UNION

Size	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
Price	$2 85	$3 65	$5 05	$7 10	$10 85

WITHOUT UNION

Size	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
Price	$1 95	$2 65	$3 70	$5 00	$7 75

ALL BRASS NICKEL-PLATED UNION ELBOWS

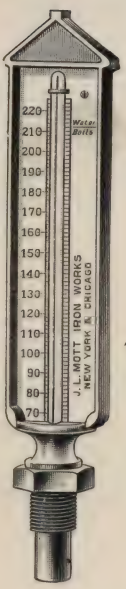
Size	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
Price	$2 00	$2 50	$3 20	$4 00	$7 00

AUTOMATIC AIR VALVES ALL NICKEL-PLATED

Thermo Automatic, for steam	per dozen,	$12 00
Russell's Automatic	"	15 00
Norwall Automatic	"	16 00
Libra Automatic	"	12 00
Allen Automatic	"	12 00

POSITIVE AIR VALVES FOR HOT WATER OR STEAM

Wood Wheel	per dozen,	$3 00
With loose key, 2 keys in each box of 12	"	3 00
Extra Keys	"	1 00



MERCURY BATH THERMOMETER

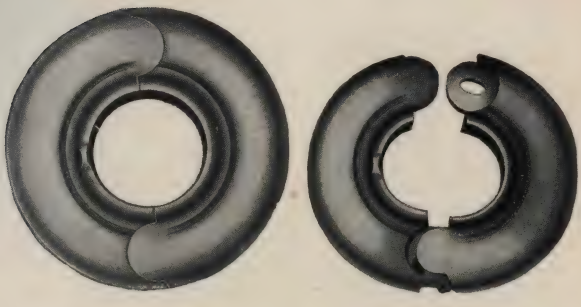
Straight, Price - - - $2 50
Angle, Price - - - 3 00

This Thermometer will accurately indicate the temperature of the water in any water heating system. It is unsurpassed for accuracy, sensitiveness, durability and practical construction.

BRONZE AND BRONZE LIQUID

Rich Gold Bronze, per pound - - - -	$1 20
Pale Gold Bronze, " - - - -	1 20
Copper Bronze " - - - -	1 40
Fire Bronze " - - - -	1 40
Aluminum, per pound, in half pound cans - -	3 00
Bronze Liquid, per gallon, in quart cans - -	2 00
" " " in half gallon cans -	1 80
" " " in gallon cans - -	1 60

ADJUSTABLE FLOOR PLATES



Size	¾ in.	1 in.	1¼ in.	1½ in.	2 in.	2½ in.	3 in.
Price, black	.09	.12	.14	.16	.20	.35	.60
Price, N. P.	.25	.28	.32	.35	.38	.52	.75

STANDARD ALTITUDE GAUGE

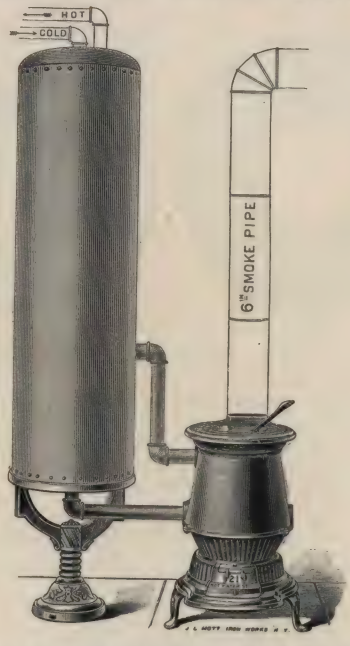
For indicating the height of water in the Expansion Tank of a Water Heating Apparatus.

Telegraphic Code Word, Roosevelt.

Price, $3 50.

The figures indicate the height of water in feet. The red hand is put stationary at point where it is desirable to keep the water level; any deviation of the movable hand indicates the change in level of the water.

SUNRAY WATER HEATING STOVES



Illustrating a method of setting up the Sunray Water Heating Stove to a Range Boiler.

Number	Size of Fire Pot	Size of Smoke Pipe	Tank Capacity in Gallons	Size of Tappings	Height of Heater	Distance from Floor to Center Return Tapping	Price
20	10	6	75	1¼	27	16	$36 00
20A	10½	6	100	1¼	28	17	40 00
21	11	7	125	1¼	30	16	44 00
21A	11½	7	150	1¼	31	17	48 00

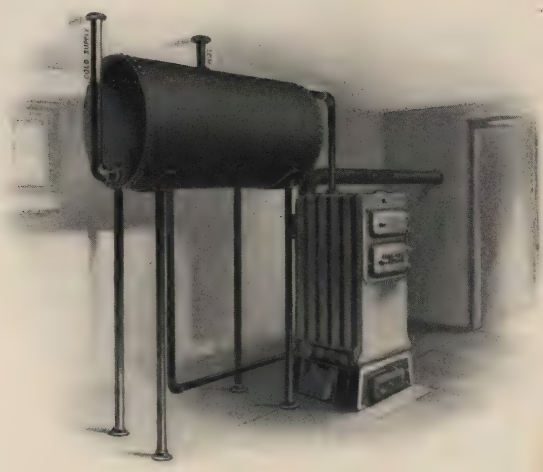
Prices do not include boiler, boiler stand or pipes.

This stove cannot be used for heating irons. The heat all goes to the water.

The tank capacities represent the size of tanks which experience has shown the heaters will supply for ordinary family use. For any special requirements, proper capacities should be provided.

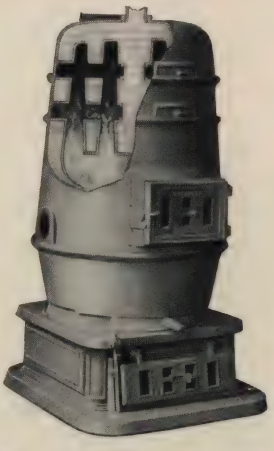
Shipped from New York, N. Y., or Trenton, N. J.

SUNRAY SECTIONAL TANK HEATERS



Illustrating a sectional Heater set up with a tank to supply water in large quantities, where a round tank Heater would not be of sufficient capacity. Any of the sectional Water Heaters can be used for this purpose. To get the tank capacity of any Water Heater, add 25 per cent. to the radiator capacity which will be safe for all regular tank heater purposes. The pressure on sectional tank heaters should not exceed 40 pounds.

SUNRAY ROUND HEATERS



DIMENSIONS AND PRICES OF TANK HEATERS

Number	Diameter of Fire Pot	Size of Base	Size of Smoke Pipe	Height of Heater	Size of Tapping	Distance from Floor to center of Bottom Tapping	Tank Capacity in Gallons	Direct Radiation	Price
22	13	21×25	6	39	2	22	200	150	$52 00
23	15	21×25	7	40	2	22	275	200	60 00
24	17	25×30	7	42	2½	23	350	275	70 00
24½	17	25×30	7	42	2½	23	425	325	85 00
25	18	25×30	8	43	2½	23	500	400	100 00
25½	18	25×30	8	47	2½	23	550	475	115 00
27	21	28×34	8	48	3	25	625	550	130 00
28	21	28×34	8	50	3	25	700	600	145 00
29	24	32×40	9	50	4	27½	775	675	160 00
30	24	32×40	9	56	4	27½	850	750	195 00
31	24	32×40	9	62	4	27½	950	850	215 00
32	24	32×40	9	68	4	27½	1050	950	245 00

All sizes up to and including No. 28 have a tapping on each side for return.

Numbers 30, 31, 32 have one 4-inch return tapping in back.

Distance from floor to center of return tapping includes legs.

The tank capacities represent the size of tanks which experience has shown the heaters will supply for ordinary family use. For special requirements, proper capacities should be provided.

Shipped from New York, N. Y., or Trenton, N. J.

ROUND SUNRAY TANK HEATERS

For Hotels, Baths and Apartment Houses, where a good apparatus is required at a moderate cost, we recommend our Round Sunray Tank Heater. It is as good as any round heater on the market, and we offer it with full confidence to our customers, knowing that it will give the best possible results.

It will be seen from the illustration of this Heater that its construction is such that all the heat generated by the burning fuel is fully utilized before the smoke is allowed to pass up the chimney.

The upper part of the fire-pot is supplied with water tubes, between which are placed deflecting plates, to spread the products of combustion over the surfaces of the upper section before they pass into the chimney, thus bringing the fire in contact with every part of the heating surface.

The lower part of the fire-pot is composed of a cast-iron shell with a fire-brick lining; it is supplied with a good substantial grate and is mounted on a strong ash-pit and base.

This Heater is made strong and durable and is tested to 75 lbs. pressure. It can be quickly set up, and has few parts that are likely to get out of order. All water joints are made before shipment, so that the fitter has only two parts to handle. This Heater has given entire satisfaction to all customers, and there are more than 9,000 in use.

SUNRAY TANK HEATERS

No.	Size of Grate	Height	Floor Space	Size of Smoke Pipe	Size of Tapping	Tank Capacity Gallons	Price
67	17	45	28×28	8″	2½″	525	$105 00
68	17	45	28×28	8″	2½″	600	115 00
69	17	47	28×28	8″	2½″	675	128 00
72	20	47	29×30	8″	3″	750	138 00
73	20	48	29×30	8″	3″	825	151 00
74	20	49	29×30	8″	3″	900	164 00

No. 68 has one intermediate section.

No. 69 has two intermediate sections.

The above heaters are tested to 150 pounds pressure and are safe for a working pressure of 75 to 85 pounds.

The tank capacities represent the size of tanks which experience has shown the heaters will supply for ordinary use. See notes on pages 117-118 re hot water requirements.

Made at and shipped from the plant near Pittsburg, Pa.

For larger tank heaters refer to Water Heaters and add 25 per cent. to radiator capacity to ascertain the tank capacity in gallons.

SUNRAY TANK HEATERS

No.	Size of Grate	Height	Floor Space	Size of Smoke Pipe	Size of Tapping	Tank Capacity Gallons	Price
62	13	36	24×24	6″	2″	300	$60 00
63	13	39	24×24	6″	2″	350	70 00
64	15	37	25×25	7″	2½″	400	80 00
65	15	40	25×25	7″	2½″	450	90 00

The above heaters are tested to 150 lbs. and are safe to work up to 75 to 85 lbs. pressure.

These heaters are efficient and economical, as all parts that are exposed to the fire contain water.

This heater is made at and shipped from the plant near Pittsburg, Pa.

SUNRAY TANK AND IRON HEATERS

DIMENSIONS AND PRICES

Number	Size of Fire Pot	Depth of Fire Pot	Size of Top	Tank Capacity in Gallons	Size of Tapping	Price
33	10	10	15″ Round	30 to 35	1″	$ 32.00

The tank capacities represent the size of tanks which experience has shown the heaters will supply for ordinary family use. For any special requirements, proper capacities should be provided.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY TANK HEATERS

Sizes 12, 13, 14.

Sizes 16, 17.

DIMENSIONS AND PRICES

Number	Size of Fire Pot	Depth of Fire Pot	Size of Smoke Pipe	Tank Capacity in Gallons	Size of Tappings	Price
12	10	9	6 in.	75	1¼″	$36 00
13	10	11	6 in.	100	1¼″	38 00
14	10	13	6 in.	125	1¼″	40 00
16	13	15	7 in.	200	1½″	46 00
17	13	18	7 in.	275	1½″	58 00

See note on ratings on opposite page.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY TANK AND IRON HEATER

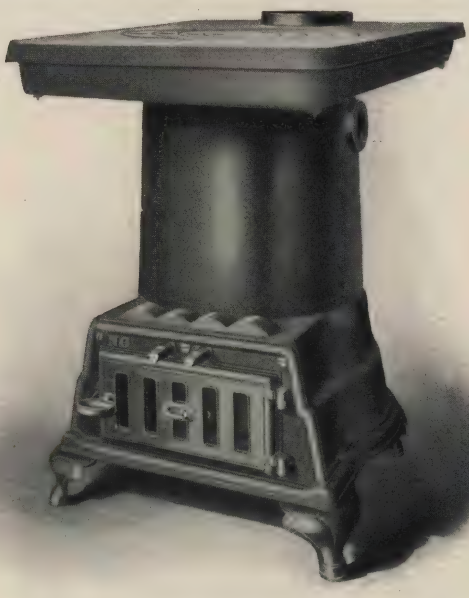
Number	Size of Top for Irons	Diameter of Fire Pot	Size of Tapping	Depth of Fire Pot	Gallons Capacity	Price
19	14×24	10″	1″	10″	40 to 75	$36 00

The tank capacities represent the size of tanks which experience has shown the heaters will supply for ordinary family use. For any special requirements, proper capacities should be provided.

As the quantity of water heated is increased the capacity for heating irons will decrease, owing to the additional heat going into the water.

Made at and shipped from the plant near Pittsburg, Pa.

SUNRAY TANK AND IRON HEATER



No.	Telegraph Code Word	Size of Top	Size of Fire Pot	Tank Capacity Gallons
18A	Zodiac	27 × 27	13 inches	80 to 150
52	Zest	27 × 27	12 inches	60 to 140

Size of Tappings	Depth of Fire Pot	Price
1½ inches	10 inches	$50 00
1¼ inches	10 inches	50 00

Fire bricks are made to fit inside of fire pot to adjust the water capacity. Top has room for about 18 irons.

The tank capacities represent the size of tanks which experience has shown the heaters will supply for ordinary family use. For any special requirements, proper capacities should be provided.

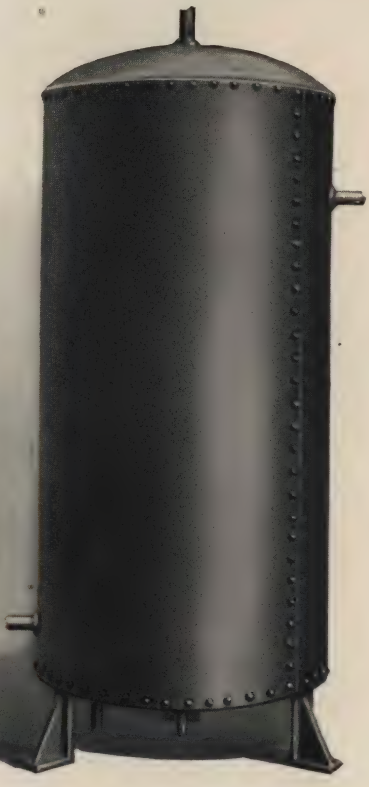
As the quantity of water heated is increased the capacity for heating irons will decrease, owing to the additional heat going into the water.

No. 18A is made at and shipped from the plant near Pittsburg, Pa.

No. 52 is made at and shipped from the plant at Trenton, N. J.

Both are kept in stock in New York.

VERTICAL AND HORIZONTAL WROUGHT STEEL TANKS



The above is an illustration of a vertical tank on feet, but the same tank may be set horizontally as on page 95.

DIMENSIONS AND CAPACITIES OF WROUGHT STEEL TANKS

Dimensions	Capacity Gallons	Average Weight	Price Black	Price Galvanized
5′ × 24″	120	300	$60 00	$80 00
6′ × 24″	145	330	62 00	85 00
7′ × 24″	170	360	68 00	95 00
8′ × 24″	200	420	74 00	105 00
5′ × 30″	185	450	67 50	100 00
6′ × 30″	220	500	73 00	102 00
7′ × 30″	257	550	81 00	117 00
8′ × 30″	300	600	88 50	130 00
10′ × 30″	375	700	103 50	154 00
6′ × 36″	325	700	90 50	165 00
7′ × 36″	375	800	100 50	170 00
8′ × 36″	425	900	109 00	175 00
10′ × 36″	530	1000	126 00	200 00
8′ × 42″	600	1250	132 00	220 00
10′ × 42″	725	1500	163 00	245 00
12′ × 42″	850	1750	175 00	280 00

All Boilers up to 6′ x 22″ are tapped 1 inch; all up to 10′ x 30″, 1½ inch; all above are tapped 2 inches. Location of tapped openings will be as shown in cut unless otherwise ordered.

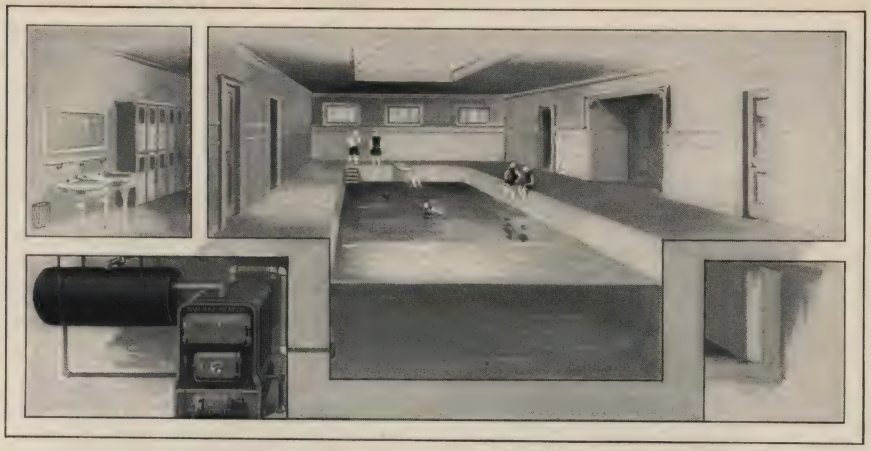
Man holes, extra $12.00. Hand holes, extra $5.00

Set of three legs as per cut, $5.00

GALVANIZED RANGE BOILERS

CAPACITIES AND PRICES

Capacity Gallons	Diameter	Price	Capacity Gallons	Diameter	Price
18	3′ × 12″	$14 50	48	6′ × 14″	$30 00
21	3½′ × 12″	15 50	52	5′ × 16″	31 00
24	4′ × 12″	15 75	53	4′ × 18″	31 50
24	3′ × 14″	19 00	63	6′ × 16″	38 00
27	4½′ × 12″	18 50	66	5′ × 18″	38 00
28	3½′ × 14″	20 25	79	6′ × 18″	44 00
30	5′ × 12″	19 00	82	5′ × 20″	45 50
32	4′ × 14″	21 00	98	6′ × 20″	61 50
35	5′ × 13″	21 00	100	5′ × 22″	63 50
36	6′ × 12″	24 50	120	5′ × 24″	72 50
36	4½′ × 14″	21 50	144	6′ × 24″	103 00
40	5′ × 14″	24 00	168	7′ × 24″	120 00
42	4′ × 16″	26 00	192	8′ × 24″	132 00
47	4½′ × 16″	30 00			



This illustration shows a bath house in which the hot water is furnished by a Sunray Water Heater and a Storage Tank. In this plant no steam is necessary, as the Water Heater transmits the heat of the fuel directly into the water. The Storage Tank is necessary in such a plant to take up the heat that may be in the fire after the pool is filled, and to store hot water for supplying shower and other baths that may be in the building.

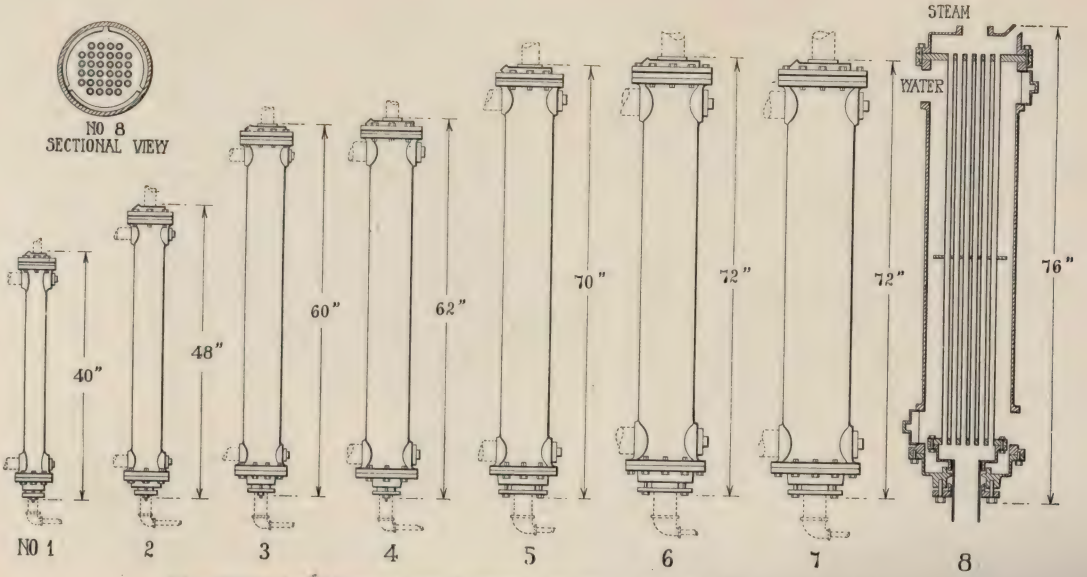
It is advisable to heat the water for the pool by passing it through the heater and tank as it is being filled. By having a thermometer on the supply pipe from the top of tank to the pool, the water can be adjusted to feed through at a temperature of 80 degrees Fahr., and the pool will keep at a temperature of 77 to 78 degrees for a week or longer. Heater and Tank may be set above the pool if desired.

THE EFFICIENT HEATER

This heater is for the purpose of heating water by steam at any pressure. It can be used without a tank when the supply of steam is ample or it may be used in connection with a tank where the steam supply is limited. It is often necessary to accumulate a quantity of hot water in a storage tank for use when needed quickly.

If the steam supply is large, it is cheaper to store the heat in the steam and use a heater without a tank, but if the supply is limited or if exhaust is being wasted it is necessary to use the storage tank to save the waste or to utilize the limited supply continuously to heat the water in the tank.

The following pages illustrate the different ways the heater can be used to suit conditions. Should none of these just suit the need, the requirement should be stated and we can suggest a heater and installation that will meet the conditions.



Illustrating the different sizes Efficient Heaters, No. 8, being a sectional view

EFFICIENT WATER HEATERS

DIMENSIONS AND PRICES

Number	Telegraph Code Word	Outside Diameter of Cylinder	Total Length of Heater to outside of Flanges	Number of ½" Tubes	Diameter of Steam Nipples Flow and Return	Size of Valve supplied with Automatic Controller	Openings for Water Circulation	Gallons Capacity 50° to 150° per hour at 40 pounds pressure	Price not including Valve or Controller	Price with Controller and Valve
1	Zone	3½"	40"	4	1¼"	1"	1½"	75	$ 30 00	$ 70 00
2	Zaza	5"	48"	5	1½"	1¼"	2"	150	50 00	95 00
3	Zuga	6"	60"	7	2"	1½"	2½"	250	70 00	120 00
4	Zila	7"	62"	13	2"	1½"	3"	500	90 00	150 00
5	Zora	8"	70"	10	2½"	2"	3"	750	120 00	180 00
6	Zip	9½"	72"	16 ¾"	3"	2"	4"	1200	180 00	250 00
7	Zebra	11"	72"	28	3"	2"	4"	2000	250 00	320 00
8	Zelo	14"	76"	32 1"	4"	2½"	4"	3000	350 00	440 00
9	Zabor	18"	84"	52	4"	3"	4"	4000	450 00	545 00

With steam at ten pounds pressure the capacity will be 25 per cent. less, and for exhaust steam proportionately less according to the pressure delivered to the heater.

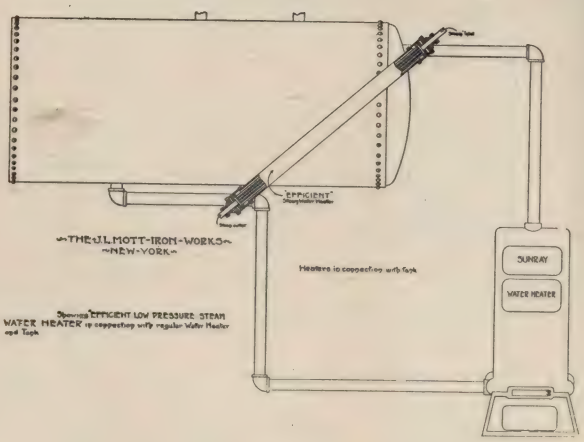
The feed and return nipples are made larger than the controlling valves supplied, to enable the heater to be used with exhaust steam if desired.

Mott's Efficient Heater is designed to supply hot water from low pressure steam in connection with a tank. It takes the place of the cumbersome and unsatisfactory coil tank. A size larger valve is sent for low pressure.

It can be used in connection with a tank of any size, and it can be arranged with or without the automatic controlling device, or it can be used without a tank with steam at any pressure.

It can be set vertically or at any angle that will drain the condensed water. The heater is supplied without legs or hangers but legs for vertical setting can be supplied for $1.00 per set extra. Please state when ordering if legs are needed.

These heaters can be supplied with all iron parts galvanized at an extra cost of 10 per cent.

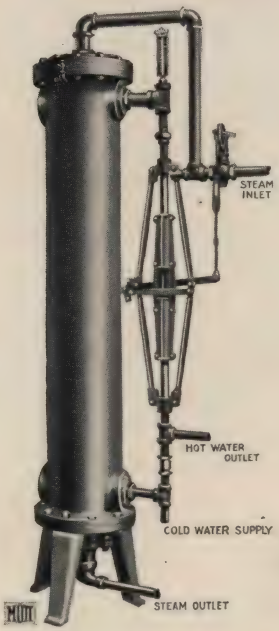


Automatic Controlling Valve can be placed on steam feed pipe and the heater may be set on any size tank.

This illustration shows the Efficient Heater set diagonally in front of tank. This position is necessary to bring the return pipe of the heater above the water line of the low pressure steam boiler.

If the water line of the steam boiler is above the return of the heater when set as in this drawing, the return end may be raised 6 inches above the bottom of tank. The bottom of heater must be 12 inches clear above water line of steam boiler.

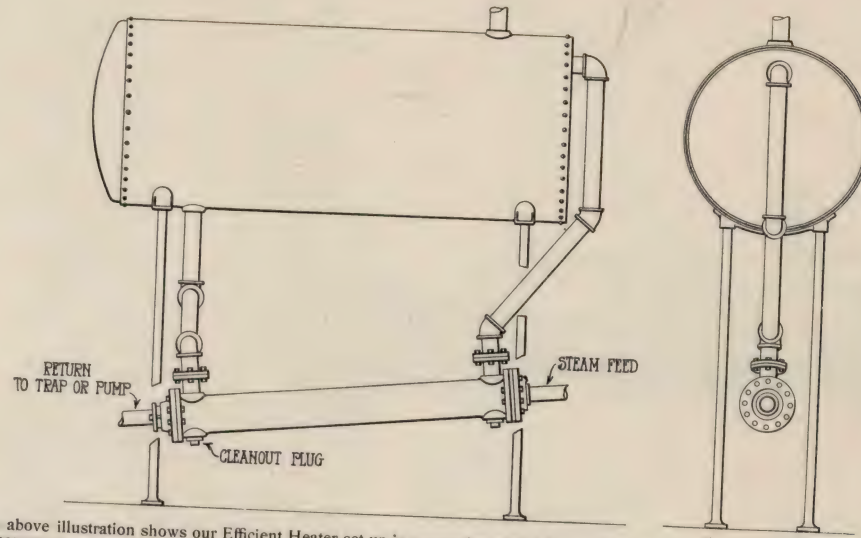
This heater is a very valuable attachment for apartment houses or any building having in use a low pressure steam heater and where a quantity of hot water is also needed.



The above illustration shows the Efficient Heater arranged with the Lawler Automatic Regulator, which is a simple and efficient device for automatically controlling the temperature of the water in the tank. It can also be arranged to work the dampers on the heaters by the same device.

When the return pipe of the Efficient Heater can be taken to a receiver or a pump governor, it is better to set it vertically as in above illustration. The combination of a Fuel Water Heater for summer use and the Efficient Water Heater for winter use is of great value for efficiency and economy.

The price of the Efficient Heater and Tank combined will not be as great as a tank of the same capacity with a coil placed inside.



The above illustration shows our Efficient Heater set up in connection with a Storage Tank. It can be used in this way for exhaust or high pressure steam, and the water of condensation may be returned to a well by a trap, or taken to a pump governor provided the pump receiver does not carry pressure. The water of condensation should be drained freely from the tubes to get good results.

TOBEY AUTOMATIC WATER HEATERS

The automatic valve consists of the lever which is acted on by the expansion tube, a balanced double-seated steam valve, and an adjusting device at the top of expansion lever. The adjustment of the temperature is governed by a set-screw, which, when once adjusted, can be locked in position so it cannot be tampered with.

By the removal of the flanges at the ends of the cylinders all the inside parts can be reached with little trouble to make repairs, if such are necessary.

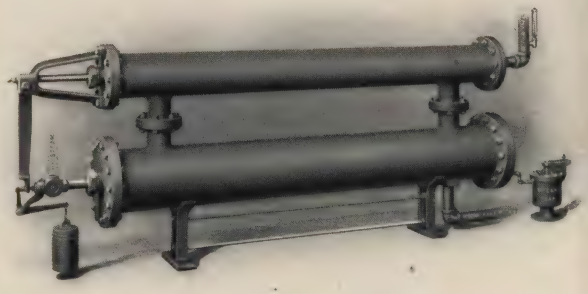
The tubes in Nos. 1A and 1½ are ¾ inch, and in the larger sizes 1 inch. Circulating pipes between the lower and upper cylinders are used on the three larger sizes only. They are not necessary in the smaller sizes. A Tobey Trap should be used with these Heaters to get the best results. The cost of trap is not included in price of Heater.

DIMENSIONS AND PRICES

Number	Telegraph Code Word	Diameter of Lower Shell in inches	Diameter of Upper Shell in inches	Length of Shell in feet	Cold Water Inlet in inches	Hot Water outlet in inches	Capacity in Gallons per hour from 50° to 150°	Price
1A	Wallace	6	4	6	2	1½	1000	$250
1½	Wantenna	9	6	6	2½	2	2000	350
2	Warner	16	8	7	3	2½	3000	475
3	Webster	16	8	8	3	2½	5000	600
4	Whittier	22	8	8	4	3	10000	1150

For high pressure, the valve on No. 1A, 1-inch; on No. 1½, 1¼-inch; on No. 2, 1½-inch; on No. 3, 2-inch, and on No. 4, 2½-inch. The low pressure valves are 1½-inch, 2-inch, 2½-inch, 3-inch and 4-inch respectively. For exhaust steam, valves can be made 2-inch, 2½-inch, 3-inch, 4-inch and 5-inch if desired, in which case an extra charge of $5.00, $8.00, $10.00, $15.00 and $20.00 will be made. The pressure on these Heaters should not exceed 50 pounds to get the best results.

TOBEY AUTOMATIC WATER HEATERS



The Tobey Automatic Water Heater is composed of two horizontal cylinders from six to eight feet long, according to the size of the heater. The upper cylinder contains a perforated copper tube through which all the hot water passes; the hot water expands this copper tube, which pushes a lever at the end of the heater and the weight closes the valve when it has reached the desired temperature; a corresponding fall in temperature will immediately contract the copper tube, and so open the valve for a fresh supply of steam.

The lower cylinder contains the tubes which receive the steam and transmit heat to the water. The tubes are connected into independent heads which have an adjustable center connection to provide for expansion and contraction. One of the flange connections between the upper and lower cylinders is made solid, so that all the cold water entering the lower cylinder must pass along and around the steam tubes before it can escape to the upper cylinder.

DIRECTIONS FOR ORDERING AND SETTING UP

When ordering a Tobey Heater be sure you get one large enough for the work to be done; and if you are not sure of the size needed, send us full particulars of what work you want to do, that is, the kind of building in which it is to be placed, and the number and kind of fixtures that are to be supplied with hot water; also, state the pressure of steam with which it is proposed to supply the Heater. The Heater will work with high pressure, low pressure or exhaust, but larger valves are used for exhaust or low pressure.

It should also be remembered that the capacity for low pressure will be about one-quarter less; and when exhaust steam is used, about one-half less than the listed capacities.

The illustration clearly shows the proper method of making connections to the Tobey Water Heater, the steam pipe to the steam valve, the waste pipe to the trap, and the water connections to and from the Heater. After water and steam have been turned on, draw a considerable quantity of water, and when the thermometer indicates the proper temperature the adjusting screw should be set so the steam shuts off at that point. A thermometer should be set on the outlet pipe near the Heater. This thermometer is not supplied with the Heater.

If it is desired at any time to increase or decrease the temperature of the water supplied, it can be adjusted by the turning of the set screw. When the Heater is adjusted to the proper temperature the set screw should be made tight with a wrench so it cannot be tampered with.

Space at return end of the heater should be provided to withdraw the tubes for cleaning purposes. This space should equal the length of heater.

COMBUSTION

The rate at which coal will burn depends largely on the strength of the chimney draft, which also determines the size of grates to be used for a given amount of work. The draft in large plants is generally stronger than in small ones, but a good rule to adopt in designing water heating plants for buildings not supplied by a steam power plant, is as follows:

For plants requiring from 100 to 300 gallons of water per hour, one square foot of grate for every 5 lbs. of coal burned per hour.

For plants of 300 to 600 gallons, one square foot of grate to 6 lbs. of coal burned per hour.

For plants of 600 to 1000 gallons per hour or larger, one square foot of grate for every 8 lbs. of coal burned per hour.

For plants of 2000 to 3000 gallons per hour one square foot of grate for every 10 lbs. of coal burned per hour.

HEATING SURFACE

It is important that there should be in every heater a proper amount of heating surface to absorb the heat of the fuel as it is burned on the grates, and the engineer should be careful that he does not select a heater having a large amount of grate surface without the necessary heating surface to absorb the heat before it escapes up the chimney.

HEATING SWIMMING POOLS

A Swimming Pool, size 60 feet x 30 feet x 5 feet, contains 9000 cubic feet, approximately equal to 558000 lbs. If it is desired to raise this quantity of water from a temperature of 40 degrees Fahrenheit to 80 degrees Fahrenheit, which is about the work to be provided for, 40 B. T. U. of heat must be furnished for each pound of water. Thus, 558000 lbs. heated 40 degrees, equals 22320000 B. T. U., and as 9800 B. T. U. per pound of coal can be transmitted, it will require 2277 lbs. of coal to do this work.

If such a tank must be filled and warmed in 5 hours, it will be necessary to burn 435 lbs. of coal per hour under one or two heaters, having approximately 35 square feet of grate surface. If ten hours can be taken to fill and warm the tank, a heater one-half this capacity will do the work.

It is not necessary to provide steam coils, nor is it necessary to circulate the water after it is in the pool, through a heater.

If a steam power plant is provided, the water can be passed through a Tobey Heater, and warmed to 80 degrees before running into the pool. If a water heater only is provided, it can pass through the heater in a similar manner, and be heated to 80 degrees as it passes on its way to the pool. The water in a pool once heated will retain its warmth for a week or ten days without additional heat.

HOT WATER REQUIRED FOR DIFFERENT FIXTURES

For each shower or bath tub, one hundred gallons per hour are necessary when such fixtures are used three times per hour; if used more frequently, an additional quantity will be necessary.

For lavatories and similar fixtures in hotels and office buildings, five gallons per hour will be sufficient, but in factories ten to fifteen gallons per hour are necessary. For hotels and kitchens of institutions, ten gallons of hot water per hour should be provided for each guest or person it is proposed to accommodate. For laundries, it is necessary to supply hot water according to their capacities for turning out work. A laundry turning out 1000 pieces per day should have a supply of hot water equal to 1000 gallons per hour, and so on for larger capacities.

It is not here intended to assert that the quantities of hot water mentioned as being necessary for difierent purposes will be actually used at all times; but provision for supplying such quantities is actually necessary, though there may be only one or two hours at a time when the apparatus will be called on to supply the maximum amount provided for.

STORAGE TANKS

Where a steam power plant is provided, and an ample supply of steam at 50 or 60 lbs. pressure can be depended on, it is not necessary to provide any storage of hot water, as the heat can be stored up in the steam with greater economy and used to heat the water only as it is needed. In cases, however, where the steam plant is too small to supply the maximum of hot water needed for special periods, it is necessary to have a storage tank in which hot water may be stored to provide for rush hours that the steam boiler capacity could not supply. The size of tank needed can be determined only by knowing the exact conditions and requirements in each case.

In cases where there is no high pressure plant provided, or where it is desired to have a plant that can be operated without expert help, the hot water can be provided by the use of Sunray Water Heaters, or by Sunray Low Pressure Steam Boilers. In all such plants, however, storage tanks are a necessity.

WHY STORAGE TANKS ARE NECESSARY

When heating water directly by fire, the heat cannot be shut off as it can be when using steam, hence a storage tank is necessary to take up the heat that remains in the fuel after the fire has been checked. The size storage tank to be used with such a plant is not at all arbitrary, but should be proportioned to the number and kind of fixtures that are to be supplied with hot water.

STORAGE TANKS FOR APARTMENT HOUSES

For apartment houses the Storage Tank should have a capacity equal to twenty-five gallons for each family in houses of ten families, twenty gallons per family in houses of twenty families, and fifteen gallons per family for larger houses. The heater should be large enough to heat such tank in two or three hours. It is not wise to put in too large a heater, as the water is apt to become over heated when little or no water is being used.

If shower baths are used a larger quantity per family should be provided.

HOT WATER SUPPLY FOR FAMILY USE

For family use twenty gallons tank capacity should be provided for each bath room, and twenty gallons for the kitchen and laundry. The water heater should have a capacity equal to the total number of gallons in tank.

POINTS ON HEATING WATER

Many mistakes are made and much disappointment occasioned by not carefully considering the actual power needed to heat water. We give herewith some information that will be useful in estimating the power required

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HORSE POWER REQUIRED

One boiler horse power is equal to the work of evaporating 34½ lbs. of water from 212 degrees—to steam at 212 degrees. As it takes 966 British Thermal Units to evaporate one pound of water from 212 degrees to steam, it follows the evaporation of 34½ lbs. is equal to 33327 B. T. U.

One gallon of water weighs (at 42 degrees) 8.33 lbs., therefore it takes 833 B. T. U. to heat one gallon 100 degrees ; or, it will take 83300 B. T. U. to heat 100 gallons and 833000 to heat 1000 gallons from 42 degrees to 142 degrees Fahrenheit, or from any other temperature at which the water may be to a point 100 degrees higher.

As 33327 B. T. U. is equal to one horse power, and the work of heating 1000 gallons equals 833000 B. T. U., we see by dividing the one into the other that heating 1000 gallons per hour is equal to practically twenty-five horse power.

FUEL NEEDED TO HEAT WATER

The amount of heat in coal varies from 13500 to 15000 B. T. U. per pound, but the average will be about 14000 B. T. U., which is the amount we assume in these calculations.

When burning coal in a Sunray Water Heater about 70 per cent. of the heat generated can be transmitted to the water which is being circulated through the heater.

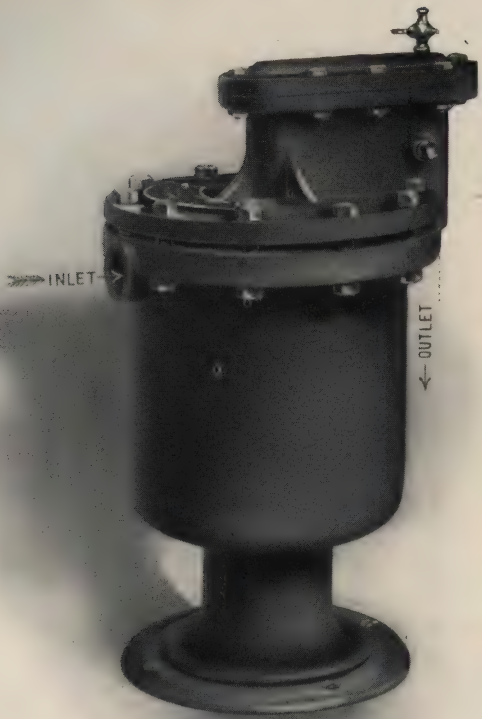
As shown in a previous paragraph it requires 833000 B. T. U. to raise the temperature of 1000 gallons of water 100 degrees Fahrenheit.

If we transmit 70 per cent. of the value of the fuel to the water (and as 70 per cent. of 14000 equals 9800 B. T. U.) for every 1000 gallons heated 100 degrees Fahr., we must burn 85 lbs. of coal.

SIZE OF HEATER

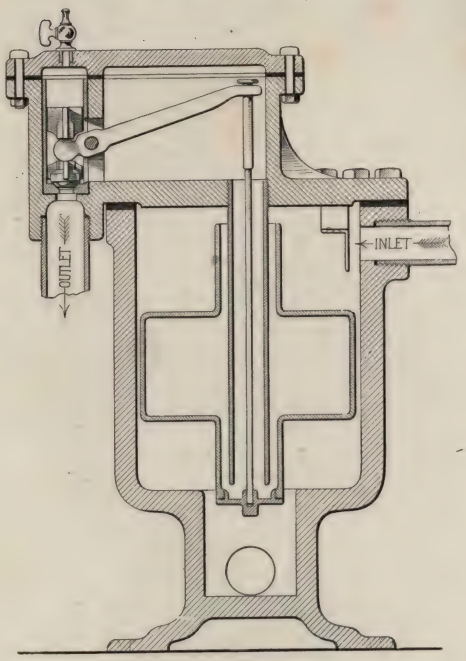
In specifying Heaters for any given capacity be sure to see that one is provided that will burn the fuel economically. If the Heater is too small, the fire will have to be forced and a larger percentage of the heat will escape up the chimney.

TOBEY STEAM TRAPS



DIMENSIONS AND PRICES

No.	Telegraph Code Word	Size of Inlet	Size of Outlet	Capacity for Draining 1-inch Pipe	Price
1½	Tennyson	¾ inch	¾ inch	9000 feet	$40 00
2	Thackeray	1 "	1 "	20000 "	50 00
2½	Thomson	1 "	1 "	25000 "	60 00
3	Tolstoi	1¼ "	1¼ "	45000 "	80 00



DESCRIPTION

By reference to the sectional cut of the Tobey Steam Trap, it will be seen that the shell forming the body of the trap contains the swimmer or float and the receiving inlet pipe. The lid or cover has formed in it a chamber which contains a lever and valve. There is a pipe fastened in the cover and open at both ends, extending from this chamber to the bottom of float. The rod running through is rigidly fastened into the bottom of float, and extends through pipe to engage long arm of lever, which is forked. The valve is composed of an upper and lower portion, forming guides, which are connected by a shaft received into the fork of the lever, and allowing the valve to rotate. There is a cap to close the opening through which the valve is inserted in place.

PROPORTIONING STEAM RADIATION

While the radiating surface which will be required in any room largely depends upon the proportion of exposed wall and glass surface, there must, nevertheless, be some relation to the cubical contents of same; therefore, as the simplest and most readily comprehended rule of apportioning radiation, we offer the following, derived from the experience of the best heating engineers—the proposition being a detached building of average construction with exposure and outside temperature at zero:

ONE SQUARE FOOT OF DIRECT RADIATION WILL HEAT:

Dwellings	Cubic feet of space by steam
Living Rooms, one side exposed	50 to 55
Living Rooms, two sides exposed	45 to 50
Living Rooms, three sides exposed	40 to 45
Sleeping Rooms	50 to 70
Halls and Bath Rooms	40 to 50
Public Buildings	
Offices	50 to 75
School Rooms	40 to 60
Factories and Stores	70 to 100
Assembly Halls and Churches	100 to 150

For Direct-Indirect Radiation, add 25 per cent., and for Indirect Radiation add 60 per cent., to the amount of direct surface to secure equal value of heating surface.

Allowance should be made for extraordinary conditions, such as character of buildings, location, exposure and quality of construction, loose windows and doors and unusual glass exposure, and the necessary lengths of distributing mains.

STEAM OR WATER INDIRECT

Square feet in stack	50	60	70	80	90	100
Cold Air Duct first floor, sq. in., in area	60	70	80	90	100	110
Cold Air Duct. upper floors, sq. in., in area	50	60	70	80	90	100
Warm Air Duct. first floor, sq. in., in area	90	100	115	130	145	160
Warm Air Duct. upper floors, sq. in. in area	60	70	80	90	100	110
Rectangular Registers first floors	10x14	12x15	12x15	12x19	16x20	16x22
Rectangular Registers upper floors	8x10	9x12	10x14	12x15	12x19	12x19

PROPORTIONING WATER RADIATION

FOR ZERO WEATHER

ONE SQUARE FOOT OF DIRECT RADIATION WILL HEAT:

Dwellings	Cubic feet of space by hot water
Living Rooms, one side exposed	25 to 30
Living Rooms, two sides exposed	20 to 25
Living Rooms, three sides exposed	15 to 20
Sleeping Rooms	30 to 35
Halls and Bath Rooms	20 to 30
Public Buildings	
Offices	30 to 40
School Rooms	20 to 30
Factories and Stores	40 to 60
Assembly Halls and Churches	60 to 80

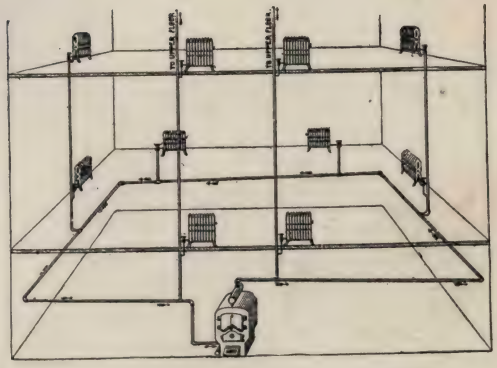
For Direct-Indirect Radiation, add 33⅓ per cent and for Indirect Radiation add 75 per cent to the amount of direct surface to secure equal value of heating surface.

Allowances should be made for extraordinary conditions such as character of buildings, location, exposure, and quality of construction, loose windows and doors and unusual glass exposure, and the necessary lengths of distributing mains.

In apportioning the amount of Indirect surface to be used in connection with a heating system, it should be remembered that this manner of heating should be in connection with some system of ventilation, and therefore, a larger volume of air must be warmed than when using direct radiation, and proportionately with the system of ventilation. In buildings with a medium provision for ventilation, it is a good practice to add 75 per cent. to that which would be required in direct surface to obtain the amount of indirect required.

HANGING INDIRECT STACKS

For cleanliness, as well as for obtaining the best results, indirect stacks should be hung one side of the register or warm air flue opening, receiving the warm air duct from the end of the indirect casing close to the top, and the cold air duct at the bottom of the opposite end. A space of ten inches (preferably twelve) should be allowed for warm air above the stack, and ten inches below for cold air.



SINGLE PIPE STEAM HEATING SYSTEM

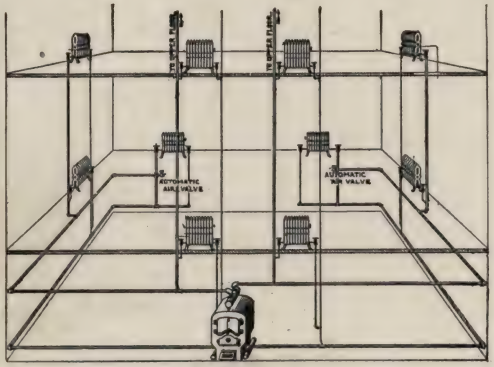
Illustrating a single pipe Steam Heating system, as applied to a residence of two floors. The extreme simplicity of this system will be appreciated.

The same arrangement will do for any size building provided the conditions permit this method to be adopted. A fall on the main of one inch in every twelve feet is necessary to produce the best results.

The pipe should run as near the ceiling as possible on the start, to allow for this fall, or the extreme end of the main pipe may be too low for head room.

It is well to put an automatic air valve at the end of return main before dropping down below the water line.

The end of main should be not less than 12 inches above the water line of boiler, and 36 inches will be better.

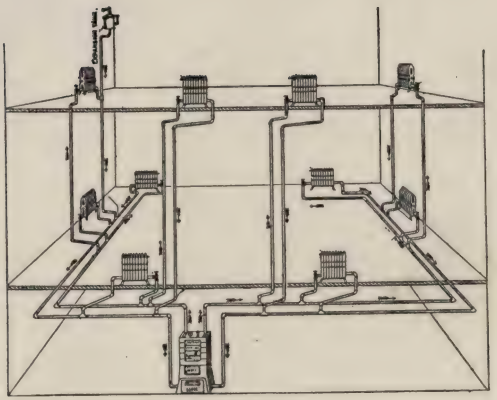


TWO-PIPE SYSTEM OF STEAM HEATING

Illustrating a two-pipe system of Steam Heating adapted only for buildings extending over large areas or for a residence where indirect radiation is used.

This system can be modified in many ways to suit conditions.

It may be arranged by a wet return as shown in the cut, or with partly dry returns and wet returns in the vicinity of the boiler.

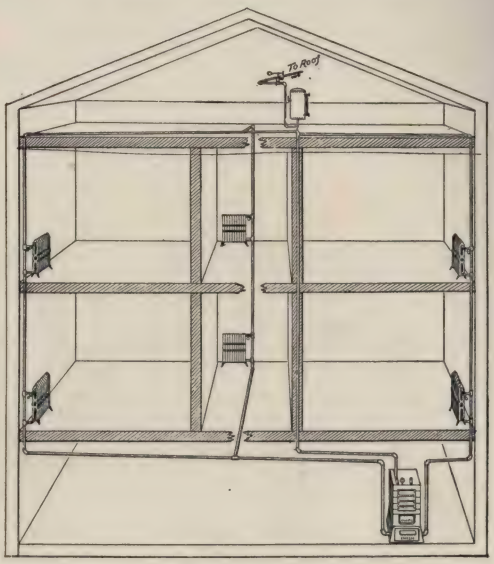


DIRECT HOT WATER HEATING

Illustrating a house system of Direct Hot Water Heating, showing flow and return pipes from the heater to the various radiators on the two floors above.

On account of bringing all the main pipes in the cellar, this system is very widely used and gives very satisfactory results.

The single main pipe system is now used a great deal, and is run very similar to the single pipe steam system on page 123, except that all radiators and risers must be double, the feed continuing out of the top of main and the return going in at the side; or by the use of a special double fitting, the pipes may both be taken off the top, the return connection going to the bottom around the jacket of the fitting.



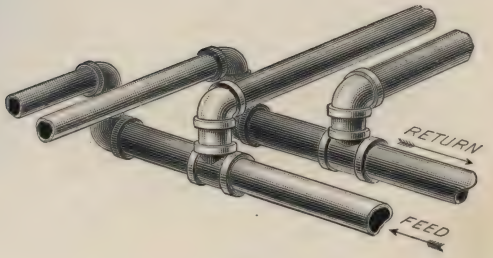
OVERHEAD FEED SYSTEM OF HOT WATER HEATING

Illustrating an overhead feed system of Hot Water Heating. In this method of water heating, the flow pipe is at once taken to a point in the attic for distribution, at which point the expansion tank is located and on which is placed a safety valve set at 10 pounds, and all radiators fed by the fall of the water due to the cooling in the radiators.

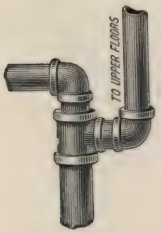
This system requires no air valves on the radiators, as all air goes up to the expansion tank. Top feed radiators (with return on same end) are used in this system.

This is really a two pipe main, and single pipe riser system.

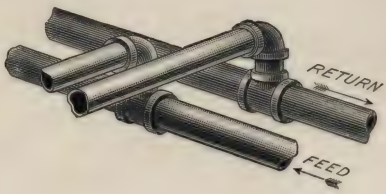
It is recommended for any building in which there is no objection to the overhead pipes in the attic. The Honeywell Generator may be used in place of the safety valve.



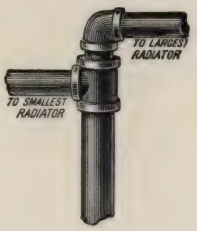
Illustrating the best way to take hot water connections from the end of mains. The end connections should turn up and the pipes run at the same level as the pipes nearer the heaters so as to give the last pipes the same advantage as the others.



Illustrating how connections on hot water risers should be made so as to give all the advantage to the lower floor. The tendency is for the hot water to flow to the upper floors and means similar to the above are necessary to offset this tendency.



Illustrating the best way to take connection from the top of main flow and return, in hot water work. A 45° elbow may be taken from the top if the head room is limited. Steam connections should be taken off the main in the same way.



Illustrating how to take off connections from a hot water riser on the same floor, one being larger than the other.

RULES FOR PROPORTIONING RADIATION AND MAINS

Professor R. C. Carpenter of Cornell University, submits the following rule for determining the size Radiator needed for a given room:

Rule: Add the area of the glass surface in the room to one quarter of the exposed wall surface, and to this add from 1/55 to 3/55 of the cubical contents (1/55 for rooms on upper floor, 2/55 for rooms on first floor and 3/55 for large halls); then for steam multiply by .25, and for hot water by .40.

Example: A room 20×12×10 feet with glass exposure of 48 feet, ¼ of wall exposure (two sides exposed) 320 feet=80, 1/55 of 2,400=44.

48+80+44=172×.25=43 feet
If you add 2/55 the surface would be 54 feet.
If you add 3/55 the surface would be 65 feet.

PROPORTIONING THE SIZE OF MAINS

For any size system of steam or water heating the following rule will be found entirely satisfactory for mains one hundred feet long; for each one hundred feet additional use a size larger ratio.

Rule:

$$r = \frac{3.1416}{d} \qquad R = \frac{a}{r} \times 100.$$

r, represents ratio of main in inches for each one hundred feet of surface; d, diameter of pipe; R, quantity of radiation carried by size of pipe; a, area of pipe in inches.

From this the following table has been constructed.

Diameter of Pipe	Area of Pipe	Ratio to each 100 feet of surface	Quantity of Radiation, Steam or Water, on a given size pipe
1½	1.767	2.10	84
2	3.141	1.57	200
2½	4.908	1.25	400
3	7.069	1.04	700
3½	9.621	.90	1062
4	12.566	.78	1590
4½	15.904	.70	2272
5	19.625	.63	3120
6	28.274	.52	5440
7	38.484	.45	8550
8	50.265	.40	12556
9	63.617	.35	18100
10	78.54	.30	25300

HEATING GREEN HOUSES

In heating Green Houses, the consideration of the cubical contents may be overlooked, as the glass exposure is so great as to constitute almost the sole cause of the loss of heat.

If the house is 100 feet long and 20 feet wide it will contain about 2600 square feet of glass. Allowing this to be heated to 50° or 60° we would use one square foot of surface to three square feet of glass, equal to 866 feet of surface, or the same number of feet of 4-inch pipe, or 946 feet of 3-inch pipe, 1060 feet of 2½-inch pipe, 1485 feet of 2-inch pipe, and 1730 feet of 1½-inch pipe. For ordinary green house work 2-inch wrought iron pipe will give the most satisfactory results. The following table will give rules for getting at the amount of surface needed with any size pipe.

For Zero Weather	Temperature of house 50 to 60	Temperature of house 60 to 70
Number of square feet of glass by one square foot of surface	3	2.25
Number of square feet of glass heated by one foot of 4-inch cast iron pipe	3	2.25
Number of square feet of glass heated by one foot of 3-inch wrought iron pipe	2.75	2.10
Number of square feet of glass heated by one foot of 2½-inch wrought iron pipe	2.25	1.80
Number of square feet of glass heated by one foot of 2-inch wrought iron pipe	1.75	1.30
Number of square feet of glass heated by one foot of 1½-inch wrought iron pipe	1.50	1.20

We do not consider steam as good for green house heating as hot water, but it has some advantages for large houses. We would, however, never recommend it for houses having less than 2000 square feet of glass. The same general plan of piping as given for hot water may also be used for steam, except that one-third less surface will be sufficient to produce the desired heat.

Capacities of Wrought Iron Pipe

Inside diameter, inches	1	1¼	1½	2	2½	3	3½	4	5	6
Length of Pipe per square foot of external surface	2·9	2·3	2·0	1·6	1·32	1·09	0·95	0·84	0·68	0·57
Square feet surface per one lineal foot	0 34	0·43	0·50	0·62	0·75	0·92	1·05	1·18	1·46	1·74
Length of pipe necessary to contain 1 gallon of water	22·3	12·8	9·4	5·7	4·02	2·6	1·95	1·51	·96	·66

Dimensions of Standard Wrought Iron Pipe

Nominal Inside Diam. Inches	Actual Diameter Inches		Thickness Inches	Circumference Inches		Area Square Inches	
	Inside	Outside		Internal	External	Internal	External
⅛	.27	.4	.07	.84	1.27	.06	.12
¼	.36	.54	.08	1.14	1.69	.1	.22
⅜	.49	.67	.09	1.55	2.12	.19	.35
½	.62	.84	.10	1.95	2.65	.3	.55
¾	.82	1.05	.11	2.58	3.29	.53	.86
1	1.04	1.31	.13	3.29	4.13	.86	1.35
1¼	1.38	1.66	.14	4.33	5.21	1.49	2.16
1½	1.61	1.9	.14	5.06	5.96	2.03	3.83
2	2.06	2.37	.15	6.49	7.46	3.35	4.43
2½	2.46	2.87	.20	7.75	9.03	4.78	6.49
3	3.06	3.5	.21	9.63	10.96	7.38	9.62
3½	3.56	4.	.22	11.14	12.56	9.83	12.56
4	4.02	4.5	.23	12.64	14.13	12.73	15.9
4½	4.5	5.	.24	14.15	15.7	15.93	19.63
5	5.04	5.56	.25	15.84	17.47	19.99	24.29
6	6.06	6.62	.28	19.05	20.81	28.88	34.47
7	7.02	7.62	.30	22.06	23.95	38.73	45.66
8	7.98	8.62	.32	25.07	27.09	50.03	58.42
9	9.	9.68	.34	28.27	30.43	63.63	73.71
10	10.01	10.75	.36	31.47	33.77	78.83	90.79
11	11.	11.75	.37	34.55	36.91	95.03	108.43
12	12.	12.75	.37	37.7	40.05	113.09	127.67

Expansion of Wrought Iron Pipe

Temperature of the Air when Pipe is fitted	Length of Pipe when fitted	Length of Pipe when heated to							
		215°		265°		297°		338°	
		Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
Zero	100 ft.	100	1.72	100	2.12	100	2.31	100	2.70
32°	100 ft.	100	1.47	100	1.78	100	2.12	100	2.45
64°	100 ft.	100	1.21	100	1.61	100	1.87	100	2.19

EXTREME VARIATION OF TEMPERATURE IN THE U. S.

States	Cities	Highest	Lowest
Ala.	Mobile	101	11
	Montgomery	107	5
Ariz.	Grant, Fort	103	7
	Prescott	103	—18
	Yuma	118	22
Ark.	Fort Smith	104	— 7
	Little Rock	102	— 5
Cal.	Red Bluff	112	18
	Sacramento	108	19
	San Diego	101	32
Colo.	Denver	105	—29
	Las Animas	105	—26
	Montrose	98	—20
Conn.	New Haven	100	—14
	New London	93	—10
Del.	Del. Break'r	93	1
Dist. of Col.	Washington	104	—14
Flor.	Jacksonville	104	15
	Key West	100	41
	Pensacola	99	15
Ga.	Atlanta	100	— 2
	Augusta	105	6
	Savannah	105	12
Idaho	Boise City	107	—28
Ills.	Cairo	103	—16
	Chicago	100	—23
	Springfield	102	—22
Ind.	Indianapolis	101	—25
In. Ter.	Sill, Fort	107	— 9
Iowa.	Des Moines	104	—30
	Dubuque	101	—32
	Keokuk	104	—24
Kan.	Dodge City	108	—20
	Concordia	104	—25
	Leavenworth	107	—29
Ky.	Louisville	105	—20
La.	New Orleans	97	15
	Shreveport	107	1
Maine.	Eastport	88	—21
	Portland	97	—17
Md.	Baltimore	102	— 6
Mass.	Boston	101	—13
	Springfield	94	—14
Mich.	Grand Haven	92	—24
	Marquette	100	—27
	Port Huron	99	—25
Minn.	Duluth	99	—41
	St. Paul	100	—41
	St. Vincent	103	—54
Miss.	Vicksburg	101	3
Mon.	Assinb'd, Ft.	108	—55
	Custer, Ft.	106	—48
	Poplar River	110	—63
Mo.	St. Louis	106	—22
	Springfield	99	—11
N. C.	Charlotte	102	— 5
	Hatteras	92	8
	Wilmington	103	9
Neb.	North Platte	107	—35
	Omaha	105	—32
	Valentine	106	—35
Nev.	Winnemuc'a	104	—28
N. D.	Bismark	105	—44
	Buford, Ft.	107	—49
N. H.	Manchester	96	—11
N. J.	Atlantic City	99	— 7
	Cape May	91	1
	New Brunsw'k	98	—12
N. M.	Santa Fe	97	—13
	Stanton, Ft.	95	—18
N. Y.	Albany	98	—18
	N. Y. City	100	— 6
	Oswego	100	—23
Ohio.	Cincinnati	104	—12
	Columbus	103	—20
	Toledo	99	—16
Ore.	Portland	99	— 2
	Roseburg	102	— 6
	Umatilla	110	—24
Pa.	Erie	94	—16
	Philadelphia	102	— 5
	Pittsburg	103	—12
R. I.	Block Island	88	— 4
	Newport	92	— 8
S. C.	Charleston	104	10
S. D.	Yankton	103	—34
Tenn.	Chattanooga	101	— 7
	Memphis	102	— 8
	Nashville	104	—10
Texas.	Elliott, Ft.	108	—14
	Brownsville	102	18
	El Paso	113	— 5
	Palestine	102	0
Utah.	Frisco	93	0
	Salt Lake	102	—20
Vt.	Burlington	96	—25
Va.	Lynchburg	102	— 5
	Norfolk	102	4
Wash.	Dayton	109	—26
	Olympia	97	— 2
	Tatoosh Isla'd	78	14
W. V.	Morgantown	97	—10
Wis.	La Crosse	101	—43
	Milwaukee	100	—25
Wyo.	Bridger, Ft.	89	—42
	Cheyenne	100	—38
	Wash'kie Ft.	100	—54

The minus sign (—) indicates temperature below Zero.

AREAS AND CIRCUMFERENCES OF CIRCLES

Diameter	Circumference	Area	Diameter	Circumference	Area
1	3.141	.785	39	122.522	1194.59
2	6.283	3.141	40	125.664	1256.64
3	9.424	7.068	41	128.806	1320.26
4	12.566	12.566	42	131.947	1485.44
5	15.708	19.635	43	135.089	1452.21
6	18.849	28.274	44	138.230	1520.53
7	21.991	38.484	45	141.372	1590.43
8	25.132	50.265	46	144.514	1661.91
9	28.274	63.617	47	147.655	1734.95
10	31.416	78.540	48	150.797	1809.56
11	34.557	95.033	49	153.938	1885.74
12	37.699	113.098	50	157.080	1963.50
13	40.840	132.733	51	160.222	2042.82
14	43.982	153.938	52	163.363	2123.72
15	47.124	176.715	53	166.505	2206.19
16	50.265	201.062	54	169.646	2290.23
17	53.407	226.981	55	172.788	2375.83
18	56.548	254.467	56	175.930	2463.01
19	59.690	283.529	57	179.071	2551.76
20	62.832	314.160	58	182.213	2642.09
21	65.973	346.361	59	185.354	2733.98
22	69.115	380.134	60	188.496	2827.44
23	72.256	415.477	61	191.638	2922.47
24	75.398	452.390	62	194.779	3019.08
25	78.540	490.875	63	197.921	3117.25
26	81.681	530.930	64	201.062	3217.00
27	84.823	572.557	65	204.204	3318.31
28	87.964	615.754	66	207.346	3421.20
29	91.106	660.521	67	210.487	3525.66
30	94.248	706.860	68	213.629	3631.69
31	94.389	754.769	69	216.770	3739.29
32	100.531	804.250	70	219.912	3848.46
33	103.673	855.301	71	223.054	3959.20
34	106.814	907.922	72	226.195	4071.51
35	109.956	962.115	73	229.337	4185.40
36	113.098	1017.878	74	232.478	4300.85
37	116.239	1075.213	75	235.620	4417.87
38	119.381	1134.118	76	238.761	4536.47

PROPERTIES OF SATURATED STEAM

PRESSURE IN POUNDS Per square inch		Temperature in Fahrenheit Degrees	VOLUME		Latent Heat in Fahrenheit Degrees	Total Heat from Water at 32 degrees In Heat Units
By Steam Gauge	Above Atmosphere		Compared with Water	Cubic Feet of Steam from 1 lb. of water		
0	15	212.0	1642	26.36	965.2	1146.1
5	20	228.0	1229	19.72	952.8	1150.9
10	25	240.1	996	15.99	945.3	1154.6
15	30	250.4	838	13.46	937.9	1157.8
20	35	259.3	726	11.65	931.6	1160.5
25	40	267.3	640	10.27	926.0	1162.9
30	45	274.4	572	9.18	920.9	1165.1
35	50	281.0	518	8.31	916.3	1167.1
40	55	287.1	474	7.61	912.0	1169.0
45	60	292.7	437	7.01	908.0	1170.7
50	65	298.0	405	6.49	904.2	1172.3
55	70	302.9	378	6.07	900.8	1173.8
60	75	307.5	353	5.68	897.5	1175.2
65	80	312.0	333	5.35	894.3	1176.5
70	85	316.1	314	5.05	891.4	1177.9
75	90	320.2	298	4.79	888.5	1179.1
80	95	324.1	283	4.55	885.8	1180.3
85	100	327.9	270	4.33	883.1	1181.4
90	105	331.3	257	4.14	880.7	1182.4
95	110	334.6	247	3.97	878.3	1183.5
100	115	338.0	237	3.80	875.9	1184.5
110	125	344.2	219	3.51	871.5	1186.4
120	135	350.1	203	3.27	867.4	1188.2
130	145	355.6	190	3.06	863.5	1189.9
140	155	361.0	179	2.87	859.7	1191.5
150	165	366.0	169	2.71	856.2	1192.9
160	175	370.8	159	2.56	852.9	1194.4
170	185	375.3	151	2.43	849.6	1195.8
180	195	379.7	144	2.31	846.5	1197.2

TABLE OF POWER OF TRANSMITTING HEAT OF VARIOUS BUILDING SUBSTANCES, COMPARED WITH EACH OTHER

Window Glass	1.000
Oak and Walnut	.66
White Pine	.80
Pitch Pine	.100
Lath and Plaster	.75 to .100
Common Brick (rough)	.200 to .250
Common Brick (whitewashed)	.200
Granite or Slate	.250
Sheet Iron	1.030 to 1.100

TABLE OF THE SPECIFIC GRAVITY AND WEIGHT OF METALS

WATER AT 62° BEING 1000

METALS	Specific Gravity	Weight of a Cubic Foot in Pounds	Weight of a Cubic Inch in Pounds	Melting Point in Degrees Fahrenheit
Mercury	13.596	847.3	.4903	40
Lead	11.352	707.5	.4094	630
Copper Cast	8.607	536.4	.3104	2548
Brass	8.393	523.1	.3029	1650
Wrought Iron	7.788	485.3	.2809	2910
Tin	7.291	454.4	.2630	455
Zinc	7.190	448.1	.2593	793
Cast Iron	7.087	441.6	.2556	2190

RELATIVE VALUE OF NON-CONDUCTORS

[C. E. EMERY]

Non-Conductors	Value	Non-Conductors	Value
Wool Felts	1.000	Loam, dry and open	.550
Mineral Wool, No. 2	.832	Slacked Lime	.480
Mineral Wool, with Tar	.715	Gas House Carbon	.470
Sawdust	.680	Asbestos	.363
Mineral Wool, No. 1	.676	Coal Ashes	.345
Charcoal	.632	Coke, in Lumps	.277
Pine Wood, across fibre	.553	Air Space, undivided	.186

CHEMICAL COMPOSITION OF COMBUSTIBLES

PECLET

	Carbon	Hydrogen	Oxygen	Nitrogen & Sulphur	Water	Ash	Total
Alcohol	.5198	.137	.3432	------	------	------	1.000
Beeswax	.816	.139	.045	------	------	------	1.000
Coal (Average of 97 varieties)	.804	.0519	.0787	.0246	------	.0408	1.000
Coke	.850	------	------	------	------	.150	1.000
Oil of Turpentine	.884	.116	------	------	------	------	1.000
Olive Oil	.7721	.1336	.0943	------	------	------	1.000
Parafine Oil	.8522	.1478	------	------	------	------	1.000
Peat (Dry)	.580	.060	.310	------	------	.050	1.000
Peat (Charcoal)	.818	------	------	------	------	.182	1.000
Peat (Ordinary)	.464	.048	.248	------	.200	.040	1.000
Resin	.7927	.1015	.1058	------	------	----	1.000
Sperm Oil	.789	.1097	.1013	----	------	----	1.000
Spermaceti	.816	.128	.056	------	------	------	1.000
Sulphur Ether	.6531	.1333	.2136	------	------	------	1.000
Tallow	.790	.117	.093	------	------	------	1.000
Wood (Dry)	.510	.053	.417	------	------	.020	1.000
Wood (Ordinary)	.408	.042	.334	------	.200	.016	1.000
Wood (Charcoal)	.930	------	------	------	------	.070	1.000

HEATING AND EVAPORATIVE POWER OF COALS

One cubic foot of hard coal weighs 50 lbs.
One cubic foot of soft coal weighs 40 lbs.
One cubic foot of coke weighs 28 lbs.

Heine's analysis shows the stated fuel values to run :

State	Brand	B. T. U., per lb.
Arkansas	Coal Hill	11,812
	Huntington Co.	12,537
Illinois	Big Muddy	11,494 avg
	Carterville	11,601 "
	Colchester	9,848
	" Slack	9,035
	Dunferline Slack	9,401
	Duquoin	10,710
	Glen Carbon	9,740 avg.
	Girard	10,111 "
	Heitz Bluff	10,454 "
	Hurricane	11,868
	Muddy Valley	11,718
	Oakland	10,395
	St. Clair	10,068 avg.
	St. John	9,797 "
	Streator	11,403
	Trenton	10,584
	Turkey Hill	11,255 avg.
	Vulcan	9,450
Indiana	Block	10,407
Indian Territory	Atoka	11,088
	Choctaw Nation	12,789
	McAllister	13,287
Iowa	Milwaukee Pea	10,240
	What Cheer	8,702
Kentucky	Kanawha	13,345
Maryland	George's C'k Cumberland	13,700
Missouri	Bevier	9,890
	Elston	12,656
	Lump	9,414
New Mexico	Coal	11,756
Ohio	Hocking Valley	13,309
	Jackson Co.	11,600
Pennsylvania	Clearfield	14,000
	Youghiogheny	13,480
	Pittsburg Slack	11,739
Tennessee	Glen Mary	13,167
	Lump	12,215
Texas	Ft. Worth	9,450
	"	11,803
Virginia	Pocahontas	13,363
Washington	Carbon Hill	12,866
West Virginia	New River	13,374
	"	12,800

AIR REQUIRED FOR VENTILATION

An adult requires each hour for respiration and transpiration 215 feet or 215x.077=16.55 pounds, and generates 290 B. T. U. of which 99 units are in form of vapor and 191 units radiate to surrounding objects.

APPROXIMATE

An adult requires not less than 1800 cubic feet of air per hour to cover all requirements.

Each cubic ft. gas burned requires 8.5 cu. ft. air.

Each lb. oil burned requires 150 cu. ft. air.

Each lb. candles burned requires 160 cu. ft. air.

B. T. U. generated by an adult per hour, 191.

B. T. U. generated by burning 1 cu. ft. gas, 600.

B. T. U. generated by burning 1 lb. oil or candles, 15,000 to 18,000.

Average gas burner consumes approximately 4 cu. ft. gas per hour, which equals 2,400 B. T. U. per hour.

Each flame from oil lamp 430 to 515 B. T. U. per hour.

Each candle 454 to 445 B. T. U. per hour.

B. T. U.—British Thermal Units.

SPECIFICATIONS OF MASSACHUSETTS FOR HEATING AND VENTILATING PUBLIC BUILDINGS, SCHOOLS, ETC.

1. That the apparatus will, with proper management, heat all the rooms including corridors to 70° in any weather.
2. That with the rooms at 70° and a difference of not less than 40° between the temperature of the outside air and that of the air entering the room at the warm air inlet, the apparatus will supply at least thirty cubic feet of air per minute for each scholar accommodated in the rooms.
3. That such supply of air will so circulate in the rooms that no uncomfortable draught will be felt, and that the difference in temperature between any two points on the breathing plane (5 ft.) in the occupied portion of a room will not exceed 3°.
4. That vitiated air in amount equal to supply from inlets will be removed through the vent ducts.

Tests are made by anemometer at both inlet and outlet registers to see that the requirements are fulfilled.

CHIMNEY FLUES

It is necessary that area and height, thickness of walls, general structure, and the position of the top outlet with reference to the building and other buildings near by should be carefully noted in the selecting and building of a flue.

The figures given under the varying heights of chimneys are diameter measurements in inches, or, the side of a square—the theory being that the spiral ascending column of smoke and gases will make a twelve by twelve inch flue no more extensive in practical working area than a twelve inch round flue. Rectangular shapes may be used if the area is equal and the difference in width and length are not extreme.

DIRECT RADIATION *		HEIGHT OF CHIMNEY FLUE					
Steam in Square Feet	Water in Square Feet	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.	80 ft.
250	375	7.4	7.	6.7	6.4	6.2	6.
500	750	9.6	9.2	8.8	8.2	8.	6.6
750	1150	11.3	10.8	10.2	9.6	9.3	8.8
1000	1500	12.8	12.	11.4	10.8	10.5	10.
1500	2250	15.2	14.4	13.4	12.8	12.4	11.5
2000	3000	17.2	16.3	15.2	14.5	14.	13.2
3000	4500	20.6	18.5	18.2	17.2	16.6	15.8
4000	6000	23.6	22.2	20.8	19.6	19.	17.8
5000	7500	26.	24.6	23.	21.6	21.	19.4
6000	9000	28.4	26.8	25.	23.4	22.8	21.2
7000	10500	30.4	28.8	27.	25.5	24.4	23.
8000	12000	32.4	30.6	28.6	26.8	26.	24.2
9000	13500	34.	32.4	30.4	28.4	27.4	25.6
10000	15000	37.	34.	32.	30.	28.6	27.

*Figures in columns represent the diameter or side of a square of chimney required.

REGULAR SIZES FOR CHIMNEY FLUES

Herewith is a table of chimney flue sizes which is commonly used with good results:

DIRECT RADIATION *		SIZE OF FLUE	
Steam in Square Feet	Water in Square feet	Round	Square
250	400	8	8 x 8
300	500	8	8 x 8
400	700	8	8 x 8
500	850	10	8 x 12
600	1000	10	8 x 12
700	1200	10	8 x 12
800	1350	12	12 x 12
900	1500	12	12 x 12
1000	1700	12	12 x 12
1200	2100	12	12 x 12
1400	2400	14	12 x 16
1600	2700	14	12 x 16
1800	3000	14	12 x 16
2000	3400	14	12 x 16
2200	3700	16	16 x 16
3000	5100	16	16 x 16
3500	5900	18	16 x 20
5000	8500	18	16 x 20

*NOTE.—When a considerable amount of indirect radiation is to be used, add 50 per cent. to the direct radiation to get corresponding chimney capacity.

QUANTITY

	CIPHER WORD
200 sq. feet	Arabic
300 sq. feet	Arbiter
400 sq. feet	Arboret
500 sq. feet	Arcade
600 sq. feet	Arcanum
700 sq. feet	Archery
800 sq. feet	Ardency
900 sq. feet	Arena
1000 sq. feet	Argentina
1200 sq. feet	Argosy
1500 sq. feet	Aridity
1800 sq. feet	Armanda
2000 sq. feet	Armature
2500 sq. feet	Arminian
3000 sq. feet	Armistice
3500 sq. feet	Armorial
4000 sq. feet	Armpit
5000 sq. feet	Aromatics
6000 sq. feet	Arpeggio
7000 sq. feet	Arquebuse
8000 sq. feet	Arrayed
9000 sq. feet	Arrogant
10000 sq. feet	Arrow
12000 sq. feet	Arsenical
15000 sq. feet	Arterial
20000 sq. feet	Artichoke
25000 sq. feet	Articulate
30000 sq. feet	Artificer
40000 sq. feet	Artillery
50000 sq. feet	Artisan

HEIGHT OF RADIATOR

	CIPHER WORD		CIPHER WORD		CIPHER WORD
13 in.	Headland	22 in.	Helpmate	31 in.	Heretic
14 in.	Hearken	23 in.	Hemlock	32 in.	Heritage
15 in.	Heartless	24 in.	Hempen	38 in.	Heroic
16 in.	Heather	25 in.	Henchman	44 in.	Hessian
18 in.	Heedful	26 in.	Heptagon	45 in.	Heterodox
20 in.	Helmet	30 in.	Herbage		

NUMBER OF SECTIONS

	CIPHER WORD		CIPHER WORD
2 sections	Shackles	19 sections	Sherry
3 sections	Shadowy	20 sections	Shielding
4 sections	Shaggy	21 sections	Shiftiness
5 sections	Shakerism	22 sections	Shingles
6 sections	Shallow	23 sections	Shining
7 sections	Shambles	24 sections	Shipwreck
8 sections	Shamrock	25 sections	Shirkful
9 sections	Sharpness	26 sections	Shivering
10 sections	Scattered	27 sections	Shocking
11 sections	Sheathe	28 sections	Shoddy
12 sections	Sheepfold	29 sections	Shoggle
13 sections	Sheepish	30 sections	Shopworn
14 sections	Shekel	31 sections	Shopping
15 sections	Shellac	32 sections	Shoulder
16 sections	Shepard	33 sections	Shouting
17 sections	Sherbet	34 sections	Shoveling
18 sections	Sheridan	35 sections	Showery
Supply steam leg section for single pipe			Showman
Supply steam leg section for double pipe			Shredded
Supply leg with both supply and return at bottom			Shrewish
Supply hot water leg section			Shrieked
Blank leg section (steam)			Shrillness
Return steam leg section			Shrinkage
Return hot water leg section			Shrivel
Intermediate steam section			Shrubbery
Intermediate hot water section			Shunning
Middle steam leg section			Shuttle
Middle hot water leg section			Shyness

PATTERN OF RADIATOR

		CIPHER WORD
Roman Three Column, Steam,	Direct	Envy
Roman Three Column, Water,	Direct	Enter
Roman Two Column, Steam,	Direct	Endow
Roman Two Column, Water,	Direct	Energy
Roman Single Column, Steam,	Direct	Enjoin
Roman Single Column, Water,	Direct	Enforce

PATTERN OF RADIATOR—Continued

	CIPHER WORD
Mercury Three Column, Steam, Direct	Engineer
Mercury Three Column, Water, Direct	Ensign
Mercury Two Column, Steam, Direct	Enigma
Mercury Two Column, Water, Direct	Engraved
Grecian Four Column, Steam, Direct	Enamour
Grecian Four Column, Water, Direct	Endive
Grecian Three Column, Steam, Direct	Endure
Grecian Three Column, Water, Direct	Enchase
Grecian Two Column, Steam, Direct	Enervate
Grecian Two Column, Water, Direct	Enclose
Grecian Single Column, Steam, Direct	Entity
Grecian Single Column, Water, Direct	Entwine
Utility Pattern, Steam, Direct	Enlarge
Utility Pattern, Water, Direct	Envelope
Roman Three Column, Steam, Direct-Indirect	Enchane
Roman Three Column, Water, Direct-Indirect	Endear
Roman Two Column, Steam, Direct-Indirect	Encamp
Roman Two Column, Water, Direct-Indirect	Engage
Grecian Four Column, Steam, Direct-Indirect	Encroach
Grecian Four Column, Water, Direct-Indirect	Endanger
Grecian Three Column, Steam, Direct-Indirect	Ending
Grecian Three Column, Water, Direct-Indirect	Enemy
Grecian Two Column, Steam, Direct-Indirect	Engulf
Grecian Two Column, Water, Direct Indirect	Enfilade
Grecian Single Column, Steam, Direct Indirect	Enrapt
Grecian Single Column, Water, Direct Indirect	Enthrall

If the Roman, Mercury or Grecian Radiators are wanted "arranged for Wall Brackets," use the "Direct" Code Word and after it use the following—Examination

Athenian (?) ft. per section, horizontal water	Canary
Athenian (?) ft. per section, vertical water	Robin
Athenian (?) ft. per section, horizontal steam	Oriole
Athenian (?) ft. per section, vertical steam	Thrush
Athenian as per cut number	Tallow
Pin Indirect, 10 foot per section	Export
Pin Indirect, 15 foot per section	Expose
School Pin Indirect, 20 foot per section	Expelled
Roman Champion Indirect, 10 foot per section	Extend

BUSHING INSTRUCTIONS

	CIPHER WORD		CIPHER WORD
¾ in. single pipe	Tablature	1½ × 1¼ in	Tamarind
¾ × ¾ in	Tableau	1½ × 1½ in	Tandems
1 × ¾ in	Tacituan	1½ in. single pipe	Tangency
1 × 1 in	Tactician	2 × ½ in	Tangling
1 in. single pipe	Taffeta	2 in. single pipe	Tannery
1¼ × ¾ in	Taffrail	1½ × ½ in	Tame
1¼ × 1 in	Taintless	1¼ × ½ in	Tare
1¼ × 1¼ in	Tailoress	1 × ½ in	Tearing
1¼ in. single pipe	Talisman	¾ × ½ in	Tay
1½ × 1 in	Talmud	Tapped right hand	Tibal

Tapped for extreme top of first section	Timorous
Tapped for extreme top of second section	Tincture
Tapped underneath radiator bottom of first section	Tinkling
Tapped underneath radiator bottom of second section	Tinseled
Tapped for ¼ inch air valve	Tipstaff
All to have extra high solid legs so that the distance from floor to center of supply tapping shall be ... inches	Titular
Tapped left hand	Ticklish
Tapped for double pipe steam as per list	Tidology
Tapped for top supply and bottom return on same end	Tillage
Tapped for top supply and bottom return opposite end	Timbrel
Tapped for both supply and return tappings at bottom, same end	Timidity
Tapped for Webster system	Tidbit
Tapped for Paul system	Tiby

TELEGRAPH CODE

QUOTATIONS AND CORRESPONDENCE

	CIPHER WORD
Quote best price	Quadrate
Quote best price (?) square feet of standard (38 inch height)	Quadrille
Wire reply	Quadroon
Will wire you to-morrow morning	Quaffed
Have written	Quaggy
Answer by first mail	Quagmire
See our letter of ——— giving full particulars	Quaintly
Referring to your telegram of	Quakerism
Referring to your letter of	Qualify
Referring to our telegram of	Quandary
Referring to our letter of	Quarried
We quote you for immediate acceptance	Quash
F. O. B. factory, and less the carload rate of freight to any railroad point of destination where the maximum freight rate does not exceed 30 cents per hundred pounds	Quiver
What is the carload rate of freight to?	Quavered
What is the less than carload rate to?	Quench
Best rate of freight quoted on carload is	Querist
Best rate of freight quoted less than carload is	Quibbler
Will wire you freight rates as soon as received	Quietude
Mail us loose sheets showing ——— Radiator, for attaching to our heating estimate	Quotient

ORDERS AND SHIPMENTS

Ship immediately	Obdurate
Ship by express	Obedient
Ship by freight	Obeisance
Ship by best route	Obelisk
Ship immediately by freight and follow with tracer	Objective
Ship before present freight rates advance	Objurgate
Ship with draft and bill of lading attached	Oblate
Enter order as per inquiry of	Oblivion
Enter order at your quotation of	Obscurity
Ship by same route as order (No. or date)	Observant
Will send shipping instructions by mail	Observer
Shipping instructions for our order (No. or date) are as follows	Obstacle
Ship what you can at once	Obstinacy
Do not hold for other orders — rush quickly as possible	Obtruder
Forward as small lot, unless you have carload going at once	Obtrusive
When can you make shipment?	Obviously
New specifications will be mailed (No. or date)	Obey
Shipping instructions for order (No. or date) not received	Oblong
Can you ship by (date?)	Opportune
When will order (No. or date) be shipped	Opaque
By what route did you ship our order (No. or date)	Operas
Send tracer after our order (No. or date)	Operatics
Add to our order (No. or date)	Opiate
Duplicate our order (No. or date)	Opium
You may substitute on our order (No. or date)	Opossum
Omit ——— from our order (No. or date)	Opposer
Hold for instructions order (No. or date)	Oppressor
Could ship immediately	Optative
Expect to make shipment	Optical
Your order (No. or date) was shipped	Optician
Give date or number of order referred to	Optimism
Your order (No. or date) does not specify	Opulent
Include in first car for New York	Opposite
Include in first car for Chicago	Option
Include in first car for (?)	Opportunity

SPECIAL RADIATOR GOODS

	Cipher Word		Cipher Word
Circular for Water	Eager	Window, for Water	Ease
" " Steam	Eagle	Window, for Steam	Easel
Corner for Water	Ear	With Saddles for Marble top	East
" " Steam	Earl	With Spikes in end section add for marble top	Ebb
Dining Room, for Water	Earn		
Dining Room, for Steam	Earth		

MEASUREMENTS IN INCHES

Cipher Word		Cipher Word		Cipher Word		Cipher Word	
1/8	Animal	3/4	Buffalo	2	Calf	4	Donkey
1/4	Ape	1	Cat	2½	Canine	4½	Dromedary
3/8	Bear	1¼	Catamount	3	Dog	5	Elephant
½	Bull	1½	Camel	3½	Dormouse		

TABLE OF DATES

Cipher Word	Cipher Word	Cipher Word	Cipher Word	Cipher Word
1st - Arsk	7th - Access	13th - Aco	20th - Adz	26th - Aim
2nd - Ask	8th - Ace	14th - Adder	21st - Aft	27th - Air
3rd - Abba	9th - Acid	15th - Adept	22nd - Agate	28th - Ale
4th - Ablo	10th - Acle	16th - Adit	23rd - Agony	29th - Allen
5th - Almo	11th - Acton	17th - Adorn	24th - Ague	30th - Almond
6th - Accent	12th - Ark	18th - Adult	25th - Aid	31st - Alpha
		19th - Adout		

Cipher Word		Cipher Word		Cipher Word	
January	Hurst	May	Hill	September	Mills
February	Run	June	Way	October	Lake
March	More	July	Lawn	November	Ridge
April	Wall	August	Mine	December	Stone

NOTE.—In using the table of dates, make a compound word—thus, Askmore would mean the second day of March, and so on

TABLE OF TIME

Cipher Word		Cipher Word		Cipher Word	
1 day	Potatoes	6 days	Peas	1 week	Corn
2 days	Turnips	8 days	Beans	2 weeks	Tomatoes
3 days	Carrots	10 days	Parsnips	3 weeks	Artichokes
4 days	Cabbage	12 days	Cucumbers	1 month	Mangels
5 days	Beets	15 days	Spinach	2 months	Parsley
				3 months	Cress

NUMERALS

The Code Words may be used for quantities or amounts or for weights

Cipher Word	Cipher Word	Cipher Word	Cipher Word
21 - Among	46 - Anon	70 - Appraise	94 - Argue
22 - Amount	47 - Another	71 - Approach	95 - Arion
23 - Amor	48 - Ant	72 - Approve	96 - Arid
24 - Ample	49 - Ante	73 - Apron	97 - Aright
25 - Amply	50 - Anther	74 - Aptly	98 - Arise
26 - Amulet	51 - Antic	75 - Aqueous	99 - Armbone
27 - Amuse	52 - Anvil	76 - Aqueline	100 - Armful
28 - Amberg	53 - Anxious	77 - Arabism	200 - Armulet
29 - Anchor	54 - Aorta	78 - Arbustive	300 - Arm
30 - Ancient	55 - Apart	79 - Arbor	400 - Armory
31 - Angel	56 - Apex	80 - Arborous	500 - Armack
32 - Anger	57 - Apish	81 - Archduke	600 - Aroma
33 - Ann	58 - Apogee	82 - Arcomb	700 - Arose
34 - Angry	59 - Apostate	83 - Arch	800 - Arrack
35 - Anile	60 - Apostle	84 - Archaic	900 - Arraign
36 - Anility	61 - Appall	85 - Arched	1000 - Arrant
37 - Ankle	62 - Appeal	86 - Archer	2000 - Array
38 - Annals	63 - Appear	87 - Archives	3000 - Arrears
39 - Annual	64 - Appease	88 - Arctic	4000 - Arrest
40 - Annex	65 - Appeased	89 - Arduit	5000 - Arrive
41 - Annoy	66 - Append	90 - Ardor	6000 - Arrimer
42 - Annul	67 - Appetite	91 - Area	7000 - Arsenal
43 - Annular	68 - Apply	92 - Argol	8000 - Artery
44 - Annulet	69 - Applied	93 - Argental	9000 - Artifice
45 - Annoint			10000 - Artilize

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